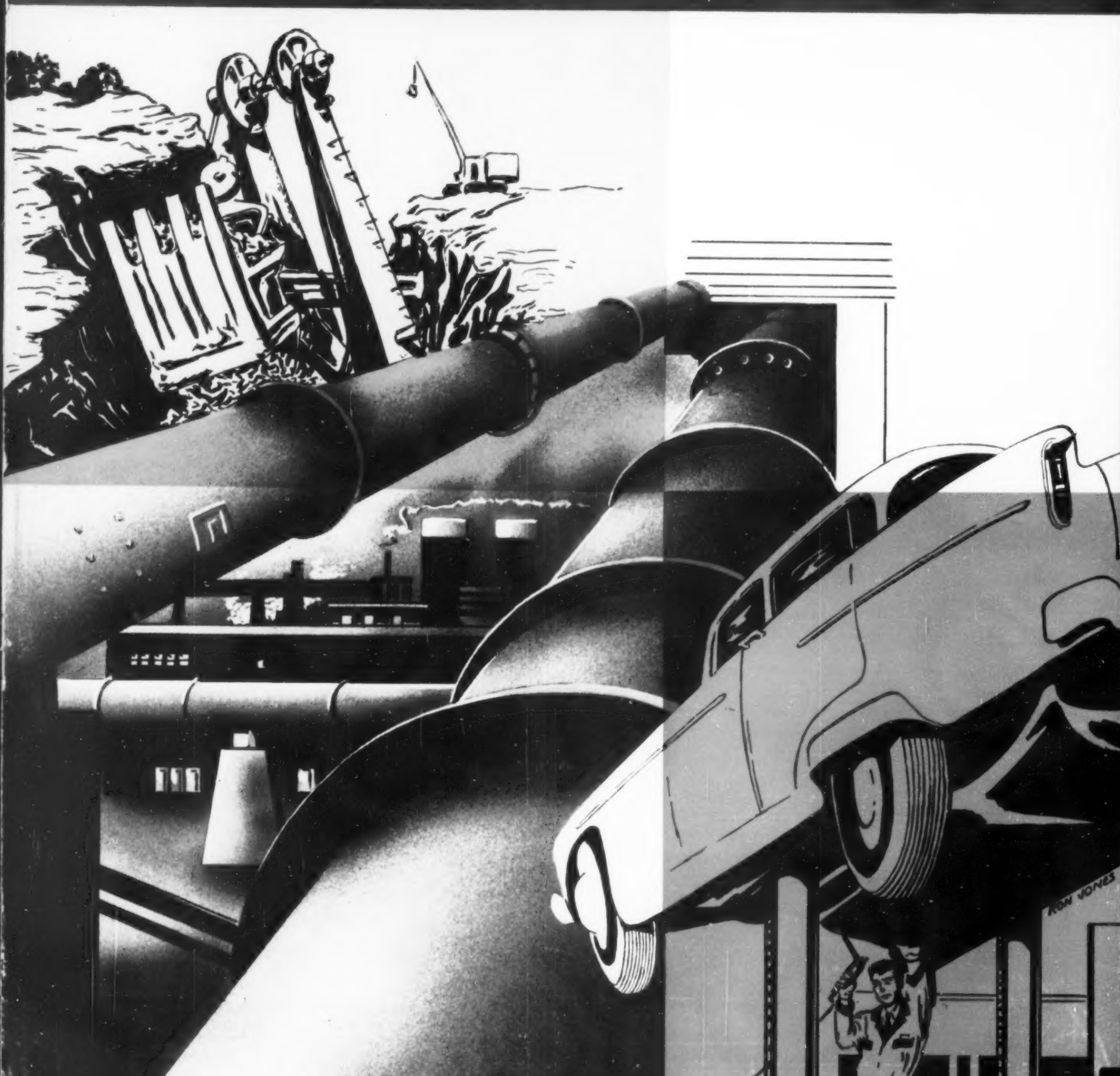
MARCH • 1955

NLGI Spokesman

Journal of National Lubricating Grease Institute



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A true multipurpose additive which sets a new standard of gear lubricant performance.

SANTO

President's page

by H. L. HEMMINGWAY, President, N L G I

Lubricate for Safety *and Comfort* at least Every 1000 Miles

There can be little argument that among the factors which strongly influence new car sales are appearance, performance and comfort. Proof of the appeal of these factors is the amazing rate of passenger car sales which has been sustained for the post war years.

Proper lubrication is the surest way to preserve two of these features—performance and comfort. Periodic chassis lubrication with quality lubricating greases is the only way that the riding comfort originally designed into the car can be maintained. Experienced chassis engineers tell us that they can tell—by the extent of deterioration of riding comfort—how recently the car was lubricated. They also say that maximum driving comfort requires chassis lubrication *at least every 1000 miles.*

Most of us have heard voluntary comments from non-experts to the effect that their cars run better, ride better and are more quiet after chassis lubrication. Conversely, even power-steering and power brakes won't make a car perform properly if it needs lubrication.

The N.L.G.I. pioneered in the use of the phrase "Lubricate for safety every 1000 miles." It has been used in nearly every issue of the "Spokesman" since the very first.

It's a good phrase, and everyone recognizes the important relationship of lubrication and safety. But, important as safety is, comfort and performance may have more positive, popular appeal. Selling performance and comfort have worked for the automobile industry. Why not make it work for us? Let's lubricate for safety—AND COMFORT—*at least* every 1000 miles!

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ABOUT THE COVER

Foote Mineral's Fred Luchenbach expressed a deep yen to sponsor our cover. He sent us a flock of nice photographs illustrating the mining of his favorite product around to its end use in car lubrication.

We showed them to artist Ronald Jones. He understood the one showing car lubrication. The others showing lithium mining and processing threw him.

"You guys getting oil with a power shovel and then running it through a plant," he wanted to know. We explained that lithium in lubricating grease helped his new fire-red Studebaker run so well.

That sold him and he came up with this cover drawing illustrating lithium mining, processing at Foote's Sunbright plant and its end use in car lubrication.

Not bad for a chap who never heard of lithium before. Could your salesmen explain the subject as well?

Selection of—

EQUIPMENT FOR SUCCESSFUL OPERATION OF A NEW GREASE PLANT

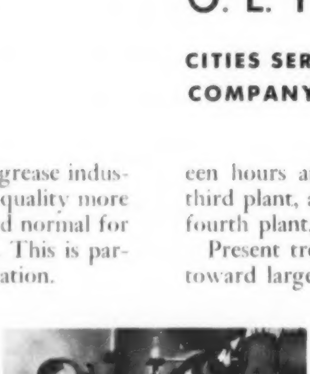
By
O. L. Yarham

CITIES SERVICE RESEARCH AND DEVELOPMENT COMPANY, EAST CHICAGO, INDIANA

During the last five years, the lubricating grease industry has been faced with demands for higher quality more uniform products. Variations once considered normal for a specific product are no longer acceptable. This is particularly true in the field of industrial lubrication.

Grease plant labor costs have increased in far greater proportion than have delivered prices of lubricating greases.

Highes quality more uniform saponifiable materials and saponifying agents and better mineral oils are being used in today's lubricants. Some of the nonsoap thickening agents of specialty lubricants are relatively expensive and it is imperative that optimum yields be obtained both from a cost and quality standpoint. For example, the action of ball and roller bearings has caused excessive hardening of products which were insufficiently dispersed during manufacture. As materials become more expensive, labor costs increase, and quality levels rise, every off-test batch of grease becomes more serious.



Article author (left) chats informally with Klaus E. Meinssen about an experimental lubricating grease.

Considerable experience with the manufacture of identical greases in four different grease plants have proved that there is an extremely wide variation in the results which are possible using different grease kettles. It was found that one grease could be made uniformly with only reasonable attention on the part of the greasemaker in six hours in one plant. In another plant, sixteen to eighteen hours and very close attention was required. In a third plant, all attempts resulted in off-test grease. In the fourth plant, the time required was ten to twelve hours.

Present trends in grease plant equipment appear to be toward larger, more powerful kettles which allow more control of mixing and temperature. Increased use is being made of milling and deaeration equipment for many types of greases. More interest is being shown in continuous or semi-continuous process equipment by manufacturers intending to concentrate on large volumes of one type of grease such as the currently popular multipurpose lithium soap base product.

The Grease Kettle and Accessories

The average working capacity of modern grease mixers is 2000 gallons, or roughly 15,000 pounds. Sizes range from a few hundred pounds capacity to 30,000 pounds capacity. It is believed that one mixer was built with a capacity of 60,000 pounds. Equipment manufacturers report that where 30 to 50 horsepower drives were once supplied for large grease mixers, drives ranging from 60 to 200 horsepower are now being supplied. The grease manufacturer who can make the best use of mechanical power will have a distinct advantage over the one trying to operate with underpowered inefficient equipment. The use of poor equipment definitely will result in lower quality less uniform products. Since the grease products

manufactured are complex physico-chemical systems, the variations in results obtained due to improper control of mixing and temperature are often quite subtle and difficult to interpret.

To be considered successful, a grease mixer should operate for several years with no major mechanical repairs. Among the items which have caused expensive repairs and loss of production time and sometimes waste of materials are gears, bearings, scrapers, and on pressure vessels, leaking stuffing boxes.

Figure 1 illustrates the design of a double motion drivehead which has operated successfully on grease mixers in several plants for many years. Properly selected bearings are applied to support radial loads and thrust loads in either direction. Moving parts are lubricated in a bath of oil with the exception of the top vertical shaft bearing and the outside pinion shaft bearing. These are grease lubricated. In a less successful design, the designer did not provide for the upward thrust load from the force tending to separate the inner pinion shaft gear and the gear on the vertical center shaft. This resulted in abnormal bearing wear and excessive backlash of the gear teeth.

As grease mixtures become larger and more powerful it becomes feasible to use two-motor drives instead of one motor. In Figure 2, one such design is illustrated. This arrangement resulted in a saving of space at the operating floor level and simplified bearing and shaft seal designs thus materially lessening the chance of costly repairs. The gear reducers are standard items of manufacture which are rated by the manufacturer for mechanical and thermal horsepower ratings.

For successful operation, gear reducers of special untried design should be avoided if standard production units can be applied. For grease kettle agitator drives, A. G. M. A. Class II gears are generally found adequate.

Scrapers for the inner wall of the grease mixer are necessary to insure reasonable rates of heat transfer, for uniformity of mixing and to avoid local overheating.

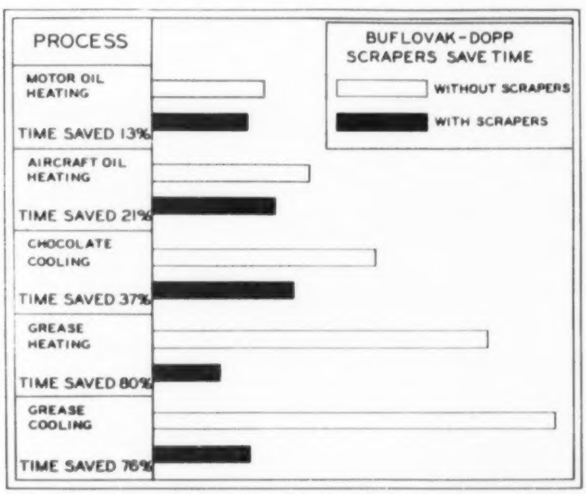


Fig. 3. Indicates time saving with scraper type agitators compared with non-scraper types. (Courtesy of Buflovak Equipment Div. of Blaw-Knox Co.)

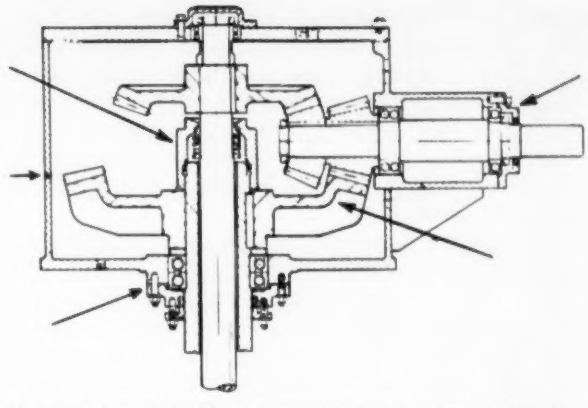


Fig. 1. Design of double motion drive head. (Courtesy Struthers Wells Corp.)

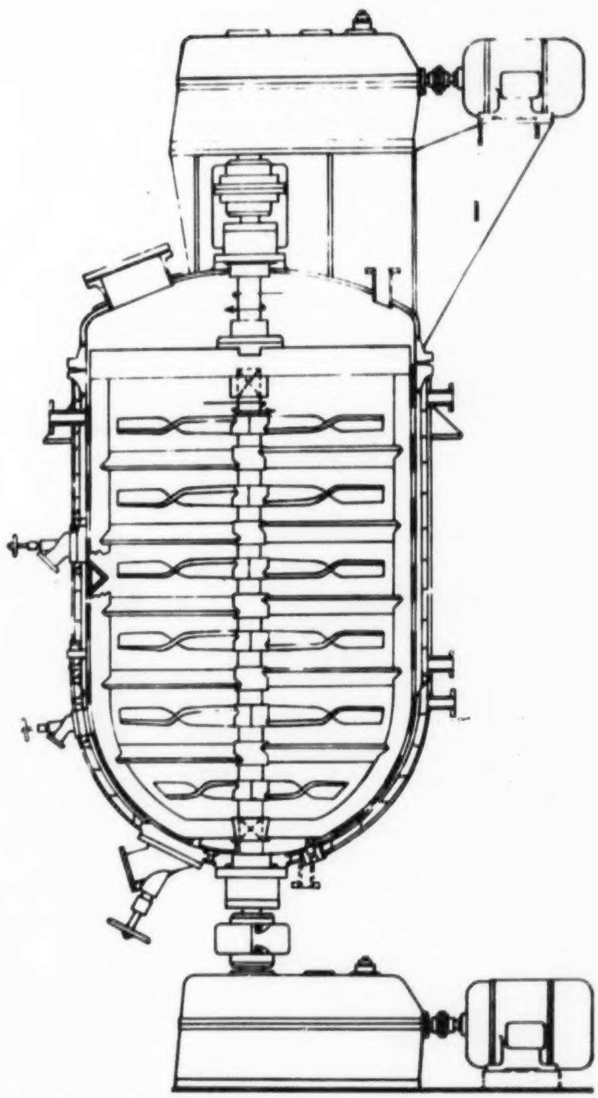


Fig. 2. Design of two motor drive. (Courtesy of Struthers Wells Corp.)

Figure 3 indicates the time saving with scraper type agitators compared to non-scraper types. Leading type scrapers of good design have proved to be reasonably satisfactory but are often susceptible to more wear and repair costs than well designed hinged follower type scrapers. Leading type scrapers of improper design have scored kettle walls even when the inner kettle wall surface was machined.

The design of a hinged follower type scraper is indicated in Figure 4. Scrapers of this design have given excellent service in grease kettles for a period of several years. In one case, eight years of service have been completed in one heavy duty grease mixer with no appreciable wear to the scraper surfaces and no damage to the kettle wall. Peripheral speed is 706 feet per minute at high speed and 353 feet per minute at low speed. Figure 5 is an illustration of a different design of a follower type scraper. Hinged follower type scrapers automatically adjust pressure to viscosity of the vessel contents. It has been determined in numerous successful operations that with good modern shop fabrication, it is not necessary to machine the inner surface of grease kettles to insure proper scraper action. However, careless workmanship should not be tolerated and it is reasonable to require concentricity of the inner shell for a 7.5-foot inside diameter mixer to be within plus or minus 0.125-inch.

While many single motion agitators are giving excellent performance on certain greases, experience with both single and doube motion kettles has proved the superior performance and flexibility of double motion agitators to be well worth the additional initial cost. Not all double motion agitators enable satisfactory mixing. Some designs have been found to allow excessive channeling during critical heavy soap stages and the agitator bars are too far apart to be self-cleaning, thus causing non-uniformity. Despite slow careful addition of oil some high soap content high viscosity material will adhere to agitator bars while the main mass of the material is diluted with oil and softened. By the time some of this material falls off the bars, the main mass has become so diluted that the viscosities of the two portions are so far apart that only a gross type of uniformity may be obtained and critical control of the necessary fine degree of dispersions or gel structure may be lost.

Agitator designs should be sufficiently sturdy to resist permanent bending under the maximum torque load of the driver. In design, a balance must be reached between the need for a streamlined agitator and the bulk necessary for the structural strength. For double motion agitators, experience has proved that closely spaced agitator bars with only about as much space between agitator bars as the projected area of one of the bars in the vertical plane has been the best design for general grease making. The agitator indicated in Figure 6 illustrates such a design.

Single-motion agitators which have performed best have the horizontal agitator bars spaced far enough apart so that the grease mass will roll through the bars and mix rather than spin with the agitator bars. In one successful design, the vessel was 6-feet inside diameter and 9-feet deep on the straight side of the inner shell. The bottom head was A. S. M. E. flanged and dished pattern. The agitator bars are placed on 24 inch centers and are 1-inch by 6-inch flat bars pitched 45 degrees, twisted to a reverse 45 degree pitch two feet from the center of the vertical shaft. The outer portion of the agitator tends to move material upward and the portion near the center vertical shaft tends to move material downward. The sweep frame consists of a ¾-inch by 4-inch flat pitched bar which is attached to the horizontal agitator bars for support. The sweep frame clears the inner kettle wall

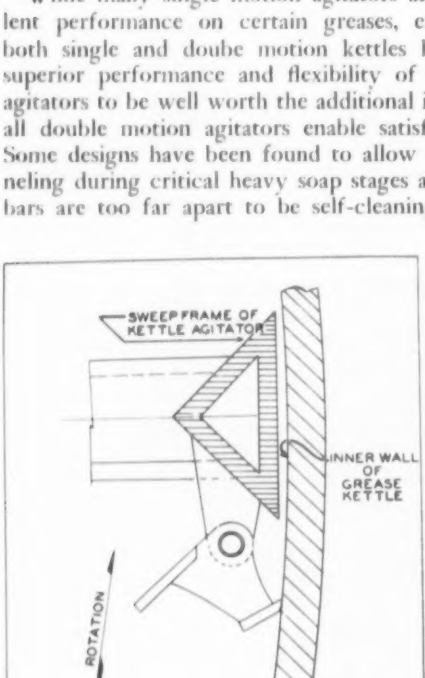


Fig. 4. Design of hinged follower type scraper.

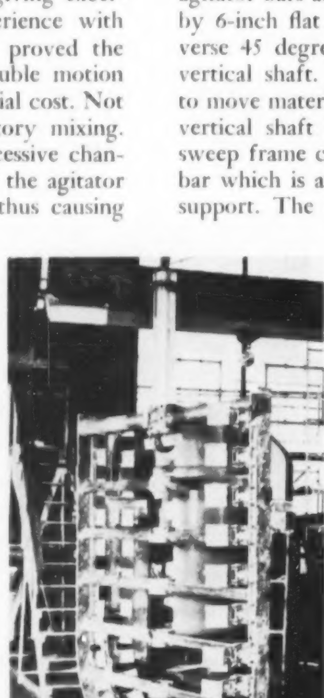


Fig. 5. Another design of follower type scraper. (Courtesy of Buflovak Equipment Div. of Blaw-Knox Co.)

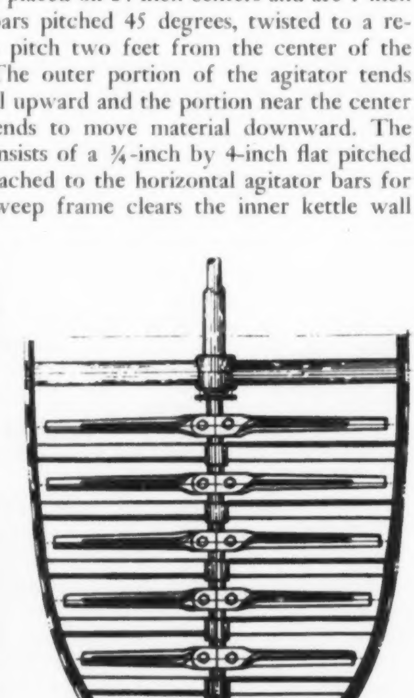


Fig. 6. Design for double motion agitators. Note space between bars. (Courtesy Buflovak Equipment Div. of Blaw-Knox Co.)

by 3/16-inch. Hinged type follower scrapers effectively scrape the inner wall. Agitator speeds are 36 and 18 R. P. M. Horsepower is 50 at either speed. The vessel is jacketed for heating by the use of steam at 150 p.s.i.g. and for alternate use of cooling water.

This grease mixer can be considered an example of the proper selection of grease plant equipment because:

1. The grease to be made in this equipment could not be manufactured in any one of several existing plant kettles because sufficient control of agitation and of heating and cooling was not possible.
2. Production for the first year from this kettle was approximately 5,000,000 pounds of uniform grease of the highest quality level consistent with the formula.
3. Net profit on the first year's production was 20 times the total installed cost of the kettle and all accessories.
4. Eight years operation has required no maintenance other than routine lubrication and inspection.

The engineer who was responsible for all features of design, installation and initial operation of the single motion agitator kettle just described feels he could today select equipment with a double motion agitator which would do even better.

To avoid intermittent loading on the drive equipment, the agitator bars attached to the center shaft of a double motion agitator should be spirally mounted. This is illustrated in Figure 7.

Grease kettle drives are usually considered constant torque application. An exception to this is the processing of "cooked-in" types of greases. This is a constant horsepower application. Most modern grease mixers are of necessity capable of some variation in agitator speeds. Some cost information and characteristics of several possible 50 H. P. primary drives for a grease mixer are tabulated in Figures 8 and 8-a. All of these different drives have been used. In addition, speed change gear boxes

COMPARATIVE COSTS OF 50 H.P. PRIMARY DRIVES FOR A GREASE KETTLE

DRIVE	SPEED VARIATION R.P.M.	TORQUE	COST INCLUDING CONTROLS
I SPEED ELECTRIC MOTOR WITH V.S. HYDRAULIC COUPLING	INFINITE 1800 TO 450	CONSTANT TORQUE	$3560
A.C. MOTOR D.C. GENERATOR V.S. D.C. DRIVE	INFINITE 1800 TO 225	CONSTANT H.P. TO 1150 R.P.M. CONST. TORQUE TO 225 R.P.M.	$7650
MECH. DRIVE STEAM TURBINE	INFINITE 1800 TO 1260	CONSTANT TORQUE	$1350
MECH DRIVE STEAM TURBINE	2000 TO 1000	CONSTANT TORQUE	$2850

Figure 8a

COMPARATIVE COSTS OF 50 H.P. PRIMARY DRIVES FOR A GREASE KETTLE

DRIVE	SPEED VARIATION RPM	TORQUE	COST INCLUDING CONTROLS
I SPEED ELECTRIC MOTOR	NONE 1800	———	$1523
2 SPEED ELECTRIC MOTOR	2 FIXED 1800 900	CONSTANT TORQUE	$2068
2 SPEED ELECTRIC MOTOR	2 FIXED 1800 900	CONSTANT H.P.	$3348
ENCLOSED VAR. PITCH PULLEYS. MOTOR. INTEGRAL	INFINITE 1800 TO 600	CONSTANT TORQUE	$5816

Figure 8

Figs. 8 and 8a (above). "Some cost information and characteristics of several possible 50 H.P. primary drives for a grease mixer are tabulated."

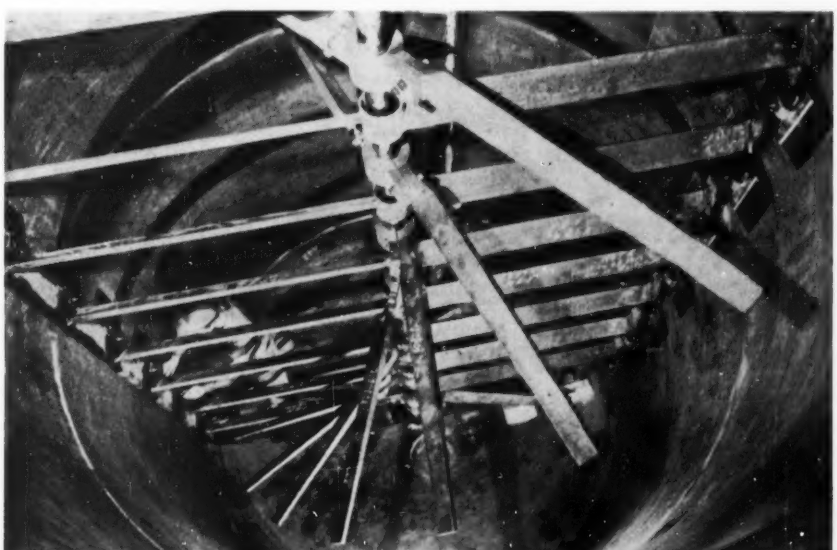


Fig. 7 (left). "Agitator bars attached to the center shaft of a double motion agitator should be spirally mounted." (Courtesy of Struthers Wells Corp.)

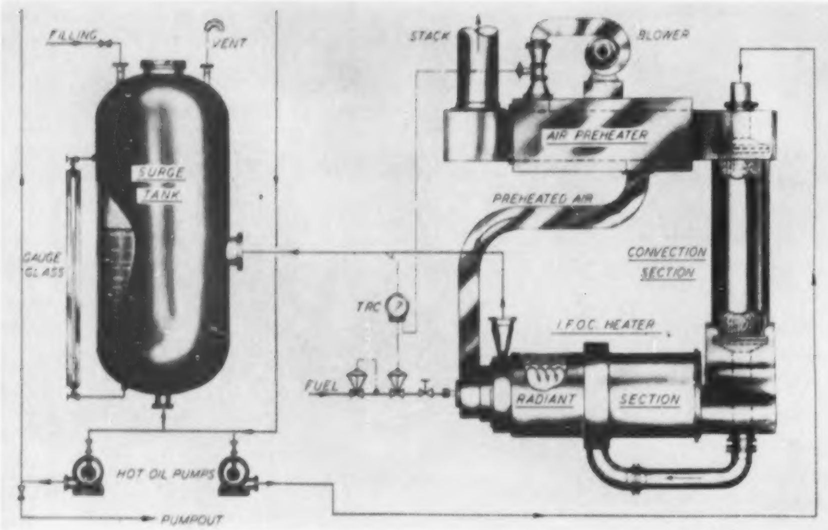
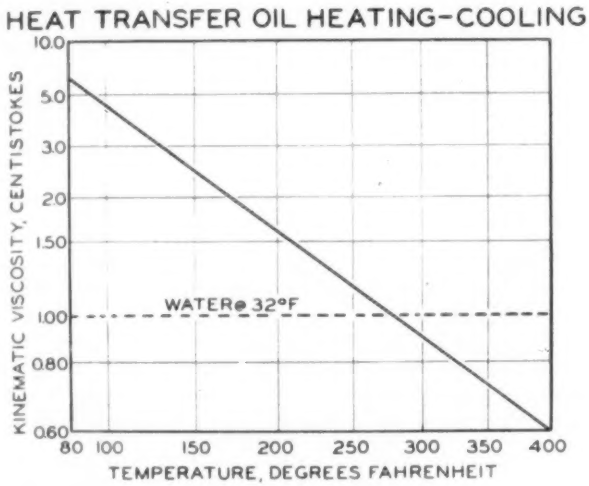


Fig. 9 (left). Design of circulating hot oil heating system. (Courtesy of Stratford Engineering Corp).

Fig. 10 (below). "Jacket oil is interchanged in heating and cooling, the same oil is used for both operations . . . The viscosity-temperature relationship of this oil is shown."



have been used. The use of a steam turbine drive may be attractive if the grease plant is adjacent to a refinery with a plentiful supply of low cost steam, or where the exhaust steam is needed for low pressure heating.

While many direct fired grease mixers are still in use, most of the recent installations are jacketed. The majority of packeted grease mixers are steam heated. Usually some cooling is needed and when steam is the heating medium, water is used for cooling. A typical jacket working pressure is 150 p.s.i.g. With a properly insulated closed top grease mixer including adequate wall scraping and agitation, it is possible to attain a grease temperature of 345 degrees F. to 335 degrees F., using saturated steam at this pressure. While this temperature is adequate for most grease processing, from 380 to 410 degrees F. top temperatures are used for best results in some plants processing multipurpose lithium greases. One of the complex soap type greases requires a temperature of 500 degrees F.

In some plants an automatically controlled gas-fired steam superheater is used to obtain higher temperatures. While the over-all efficiency may not be particularly good, the necessary temperatures can be attained and water may be used for alternate cooling.

Circulating hot mineral oil has been used as a heating medium in a few plants for several years and is becoming increasingly popular. In early installations, high viscosity paraffinic cylinder stocks or similar oils were used with flash point of 600 degrees F., and a viscosity as high as 225 S. S. U. at 210 degrees F. The thought was that the high flash of the oil would give protection against fires. This is fallacious as these heavy oils are more susceptible to thermal breakdown than other types of oils. In use, the flash point will drop as low as 220 degrees F. due to thermal cracking. Another disadvantage is that start up time may take up to 4 hours as compared to 1 hour for lower viscosity oil.

A desirable heat transfer oil is one having moderate viscosity, low pour point, high boiling range, and maximum resistance to thermal breakdown. One such oil is refinery recycle gas oil stock which is the byproduct of the oil cracking process at petroleum refineries. Other heat transfer oils made up largely of aromatic or naphthenic hydrocarbons resistant to thermal breakdown are available.

One design of a circulating hot oil heating system used in grease plants is illustrated by Figure 9. Another design used is a vertical tubular fired heater. It is possible with either type to shut down the circulating pump without damage to the heater or circulating oil providing the burners are shut off simultaneously. This is handled by automatic control instruments in proper installations.

In the engineering of a hot oil circulating system the design of the expansion tank is the portion of the system where most errors are made. It is fortunate that this part of the system is usually most easily modified to correct for original design errors.

A suitable expansion tank permits the system oil to expand with heat and acts as a cold oil seal to prevent

contact of air with the hot oil. In a properly designed system this cold oil expansion tank will be within 50 degrees F. of the surrounding air temperature. Piping is arranged to prevent convection currents and thus heating from the high temperature part of the system.

With hot oil used as the heating medium, it is evident that water cannot be used in the same jackets for cooling. In one grease plant using 200 S. S. U. at 100°F. oil for heating it was found that satisfactory cooling rates in the kettles could not be obtained for greases that had to be cooled below 140°F., even after an accessory air fan cooled heat exchanger was installed with necessary piping and cooling oil circulating pump. As the jacket oil is interchanged in heating and cooling, the same oil is used for both operations. This problem was solved by using a lower viscosity oil in the system. This oil is a thermally stable product with a viscosity of 40 S. S. U. at 100°F.

Additional data on this oil is:

Flash Point, C. O. C., °F.	280
Gravity, °A.P.I.	37
Distillation	
Initial B. P., °F.	512
End Point, °F	600

The viscosity-temperature relationship of this oil is shown in Figure 10. The time saved in cooling grease compared to 95 V. I. 200 S. S. U. at 100°F. oil and to water is shown in Figure 11. In cooling grease from 220°F. to 130°F. it is evident that a time saving of about 80% was realized. This lower viscosity oil is used up to 425°F, in the hot oil system.

Engineering design data on hot oil systems is available in an equipment manufacturer's bulletin.[1]

There seems to be some confusion as to the relative costs of jacketed grease mixers suitable for varying jacket working pressures. Figure 12 gives some July, 1954, cost comparisons. The costs are for first class equipment conforming to the highest standards of the A. S. M. E.-A. P. I. Code for pressure vessels.

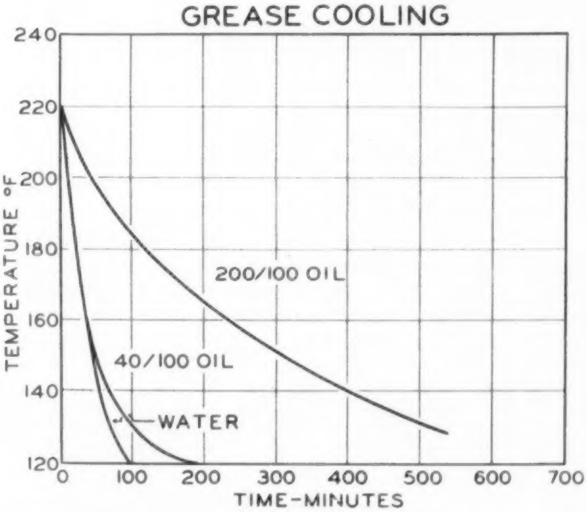


Fig. 11. "Time saved in cooling grease compared to 95 V. I. 200 S. S. U. at 100°F. oil and to water."

FIGURE 12

Approximate Cost of Jacketed Grease Kettles

2000 Gallon Working Capacity

Description	*Approximate Cost*
Open Top, Jacket Working Pressure 75 p.s.i.g.	$30,000
Open Top, Jacket Working Pressure 150 p.s.i.g.	$31,000
Open Top, Jacket Working Pressure 200 p.s.i.g.	$32,000
Open Top, Jacket Working Pressure 300 p.s.i.g.	$34,000
Closed Top, Internal Working Pressure 150 p.s.i.g, Jacket Working Pressure 75 p.s.i.g.	$34,000

In the selection of one grease kettle, it was decided that a top grease temperature of 380°F. to 390°F. would be needed. Saturated steam at 285 p.s.i.g. was available in quantity from the nearby refinery steam plant. In this case, the grease mixer was ordered with a 300 p.s.i.g working pressure jacket and connected to the refinery steam supply.

Equipment for Soap Formation

For economic reasons and for quality control reasons, the lubricating grease manufacturer makes the bulk of his own soaps. Soaps are still the thickening agents of about 98 per cent of the "greases" made today. (The word, "greases," in this case includes non-soap thickening agents.) The exception is that aluminum soaps are usually purchased.

The whole greasemaking operation may be completed in the same grease kettle whether open or closed top. In

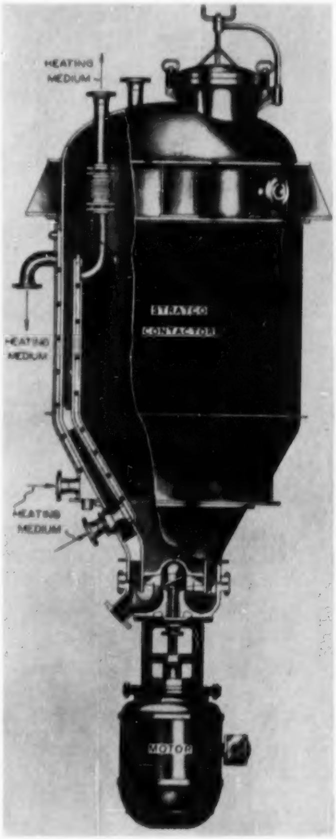


Fig. 13. Use of this type equipment has reduced soap cooking time cycles as much as one to two hours compared to open kettle cooking. (Courtesy Stratford Engineering Corp.)

the early days of greasemaking, it was proved that there is an obvious time saving by using one soap kettle to form soap stock for two or more finishing kettles. An additional time saving was obtained by the use of agitated pressure vessels to form soaps. By the use of equipment illustrated by Figure 13, soap cooking time cycles have been reduced by as much as one to two hours compared to open kettle cooking. Cooking temperatures in these vessels range from 325°F. to 375°F. Heating is by steam or hot oil. It is necessary to provide cooling for this equipment to enable charging of successive batches.

Soap is formed in pressure cookers in a portion of the mineral oil used in the batch of grease. Soap concentration ranges from about 65% to about 35%. The finished soap stock is transferred to a paddle kettle for dehydration and finishing by the use of steam pressure built up during the cooking. The transfer pipings is then purged by air or in some cases by steam. The soap transfer line should be as short as reasonably possible and should be directly connected to the finishing kettle and not tied into the re-circulating piping on the grease finishing kettle. Two-inch steel piping has generally been found adequate for the transfer line. For safety, all valves and fittings on the transfer lines should be of steel.

To avoid non-uniformity in the finished grease, some recently designed grease finishing kettles are being equipped with flush valves part way up the side of the shell to admit transferred soap stock from the pressure cooker. This is better than admission of soap from the top of the kettle as it eliminates a former non-uniformity problem caused by hang up of high soap content material on the upper part of the agitator assembly and inside surface of the top head or cover. This is illustrated in Figure 2.

Grease Pumps

Pumps are used to transport grease for moderate distances in manufacturing plants from one kettle to another, from kettle to storage tanks, from kettle to cooling pans or gelling tanks, to fill containers, to recirculate grease from bottom to top of a grease kettle to aid mixing and as metering devices to control flow rates to grease mills, deaerators or continuous processing units.

In many grease plants, pump failures and necessary repairs and replacements have been a major item of expense and the cause of production delays. The most severe pump service in a grease plant is the use of a pump for recirculation on a grease kettle, particularly when as a part of the processing it is necessary to circulate the grease in the heavy soap stage. Under this condition, it is not possible to use a strainer on the suction side of the pump to prevent damage from foreign materials which will sometimes appear.

Such damage can be minimized but not entirely prevented by the use of controlled torque couplings, torque limiting devices built into gear reducers, or shear pin couplings. For a particular make of gear pump it was found that the spline between the pump driveshaft and the driving gear of the pump would fail when foreign material entered the pump. Usually, the rough spots on the pump gears could be smoothed with a stone, a new splined shaft installed and the pump placed back in service in about an hour.

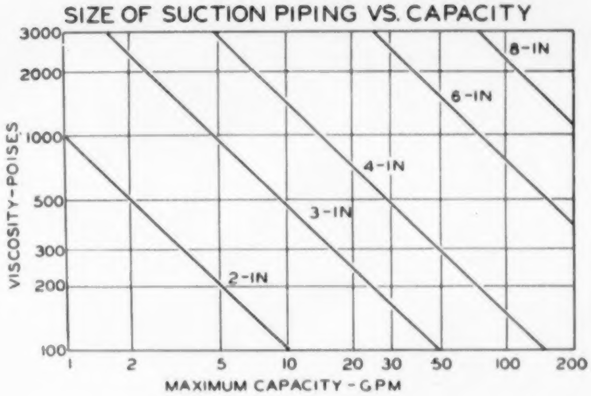


Fig. 15. "Shows how to select the proper size suction piping."

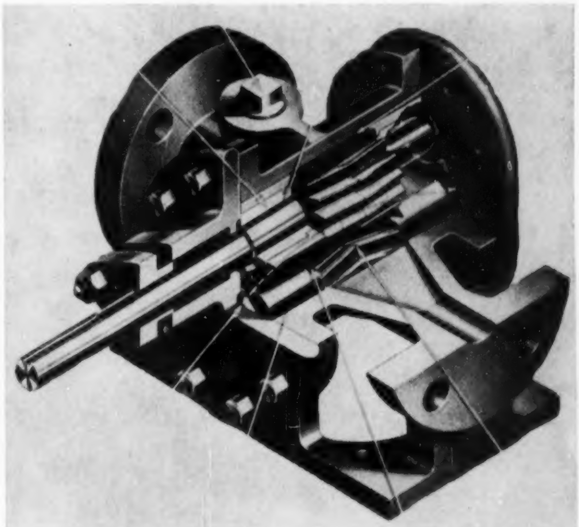
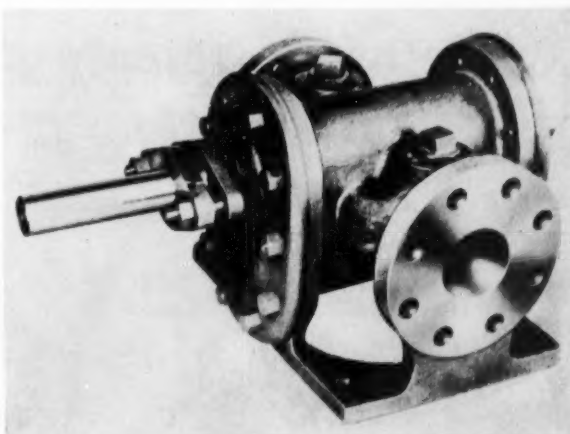


Fig. 16 (Courtesy Schutte and Koerting Co.)



Figs. 16 and 17. "One type of pump which has performed very well under grease kettles." (Courtesy Schutte and Koerting Co.)


INTERNATIONAL

Among the typical mistakes made in the selection and installation of grease pumps are:

1. Excessively long suction piping of inadequate size.
2. Discharge piping too small or too long.
3. Failure to use a self-cleaning type of strainer on the discharge side of the pump rather than on ordinary screen.
4. Pump is driven too fast for its design or is too light in construction for heavy duty service.
5. A type is selected which gives one or two pulses per revolution and thus causes excessive noise and vibration to piping and other equipment.
6. Relief valves of close compact design are not provided.
7. Lines are not heated where needed.

In the selection of pumps and the design of grease piping, previous plant experience is the best source of information. Quite often a few tests using diaphragm protected pressure gages on grease plant lines will give necessary information.

A simple formula from which pressure drop can be estimated knowing viscosity or from which viscosity may be estimated for laminar flow conditions such as found in pumping grease has been suggested by Worcester:[2]

$P = \frac{27.3 \times \mu \times Q}{d^4}$, in which

P = pressure loss in pounds per square inch per 1000 feet of pipe.

μ = absolute viscosity expressed in poises (Stokes x S.G.)

S. G. = specific gravity

Q = quantity in U. S. gallons (per minute)

d = actual inside diameter of pipe in inches

If plant test data is not available, pressure loss in plant grease lines is sometimes estimated from data obtained with the S. O. D. Pressure Viscometer.

The data presented in Figure 14 was obtained in this manner.

FIGURE 14

Pressure Loss in Plant Grease Lines Estimated from S. O. D. Viscometer Tests

Grease Tested	*Temp. °F.*	*Pipe Size*	*Flow G.P.M.*	*Rate of Shear Sec.⁻¹*	*Ap. Vis. Poises*	*P.S.I.G. Per 10 Feet of Pipe*
No. 3 Li	77	2"	10	44.1	410	66
No. 3 Li	134	2"	10	44.1	305	49
No. 3 Li	134	3"	10	13.5	880	28
No. 3 Li	134	3"	40	54.0	255	33
No. 3 Li	77	3"	40	54.0	345	44
No. 2 Li	77	3"	40	54.0	228	29
No. 2 Na	77	3"	40	54.0	382	49

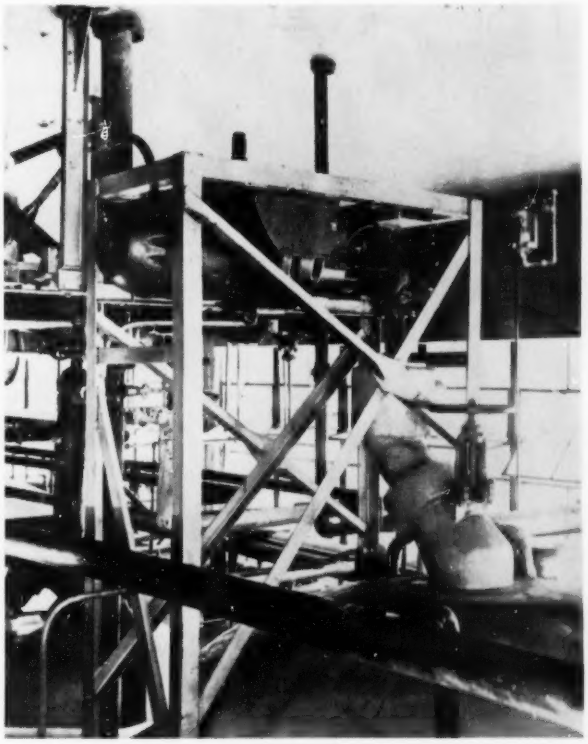


Fig. 20. "Also illustrates sound engineering practice" (Courtesy Sinclair Refining Co.)

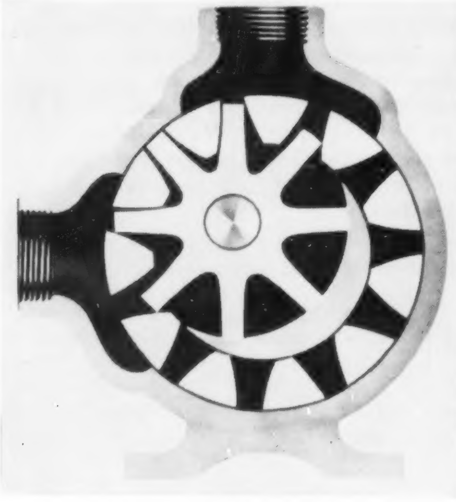


Fig. 18 (Courtesy Viking Pump Co.)

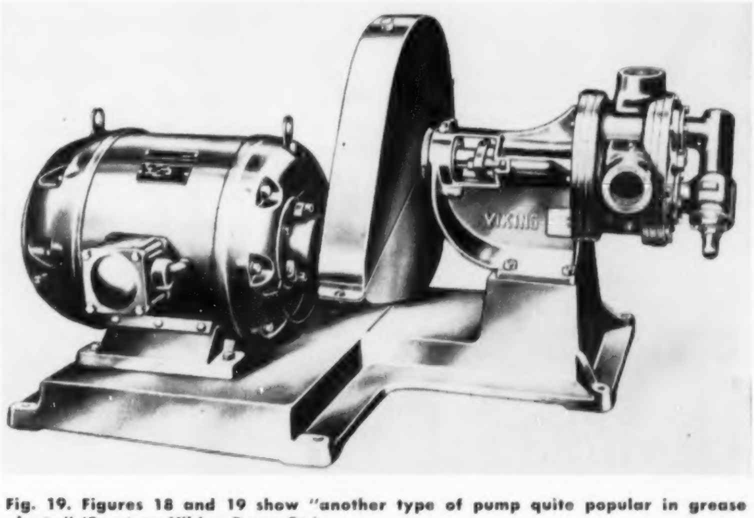


Fig. 19. Figures 18 and 19 show "another type of pump quite popular in grease plants." (Courtesy Viking Pump Co.)

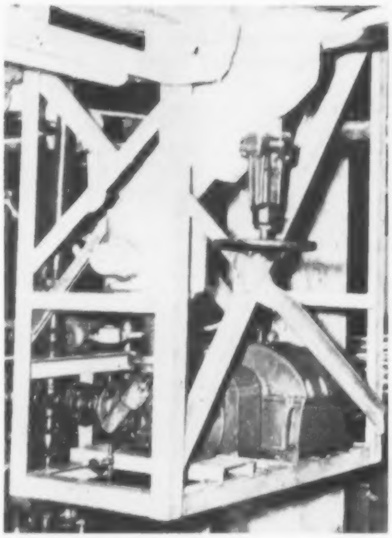


Fig. 21. Another view of Figure 20. (Courtesy Sinclair Refining Co.)

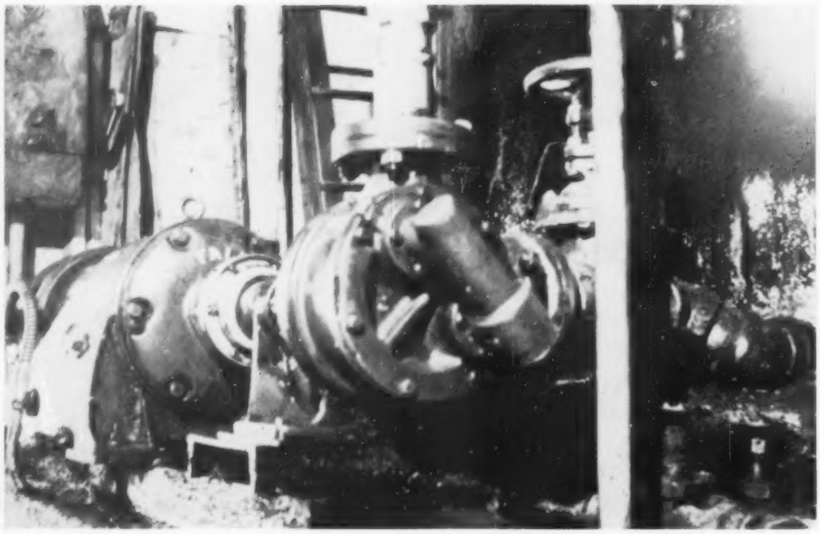


Fig. 21b. Another view of Figs. 20 and 21. "View shows a compact relief valve arrangement built into the pump head." (Courtesy Sinclair Refining Co.)

Since atmospheric pressure (14.7 p.s.i.a.) is the only force, other than slight static head pressure due to depth of grease, which can cause a grease to feed to a pump, piping conditions on the suction side of the pump are quite critical.

Figure 15 shows how to select the proper size suction line to a pump for different capacities and viscosities when the suction line is not over five feet long. A reduction factor of 5% in capacity will compensate for two 90° elbows. From the figure, it is apparent why 8-inch flush bottom valves are in common use as bottom grease outlet connections for plant grease kettles. Where the process plans call for circulating the grease in the heavy soap stage during processing, plant experience indicates that for design purposes it would be well to use the maximum viscosity line in Figure 15.

One type of pump which has performed very well under grease kettles is illustrated by Figures 16 and 17. Some of the design features which contribute to satisfactory operation appear to be venturi pattern suction and discharge ports, relief grooves which avoid entrapment of pockets of material being pumped, large sturdy shafts with short bearing spans, special double helical tooth form (herringbone) gears, hardened gears and a sturdy rigid case design. Pumps of this type have been used at speeds up to 860 R. P. M. with success pumping grease as heavy as it will flow to the pump. Such a pump will work quietly under starved suction conditions. This is a remarkable contrast to the vibration which has been obtained from pumps which give one or two pulses per revolution of the driveshaft. In the herringbone design, the large number of teeth used smoothes out the pulsations.

Another type of gear pump quite popular in grease plants is illustrated in Figures 18 and 19. This type of pump is operated at slower speeds. A typical speed is 150 R. P. M. An installation of such a pump is illustrated by Figure 20. This figure also illustrates sound engineering practice in that the pump is supported on a framework under the kettle to enable a reasonably short suction line. It will also be noted that a bellows type expansion joint is used directly above the pump to prevent excessive stresses. Another view of this installation is shown by Figure 21. This view shows a compact relief valve arrangement built into the pump head. Figure 21-b shows another installation of this type of pump where the suction piping was kept as short as possible and a compact relief valve assembly was used.

Several other types of positive delivery pumps are in successful use in pumping greases. Among the types used are gear, multiple screw, rotating plunger, and single screw pumps.

In pumping greases of all soap contents, consistencies and temperatures, it is fortunate that the viscosity drops off readily with increasing rate of shear. If this were not the case, the "viscous" horsepower required to merely turn the pump rotating elements would in many pumps exceed the total power now used for this and to overcome line pressure drops. The thixotropic nature of grease is now somewhat understood, but occasionally a pump manufacturer will still try to grossly overpower a grease pump, particularly if furnished viscosity data taken at low shear rates such as obtained from pressure loss readings in grease pipe lines.

A few typical grease pump applications known to be successfully operating are as follows:

Type	*G.P.M.*	*Speed, R.P.M.*	*Horse-power*	*Pipe Connections*	*Relief Valve Setting*	*Application*
Herringbone Gear	40	860	10	3"	225#	Under Grease Kettle
Same	76	100	30	6"	...	Same
Gear Within Gear	33	150	7.5	2-½"	160#	Same

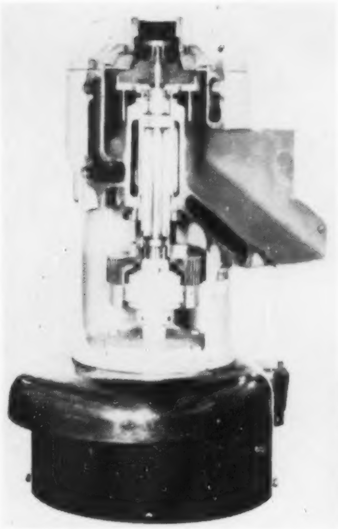


Fig. 22. "Internal construction of one mill." (Courtesy Morehouse Industries.)

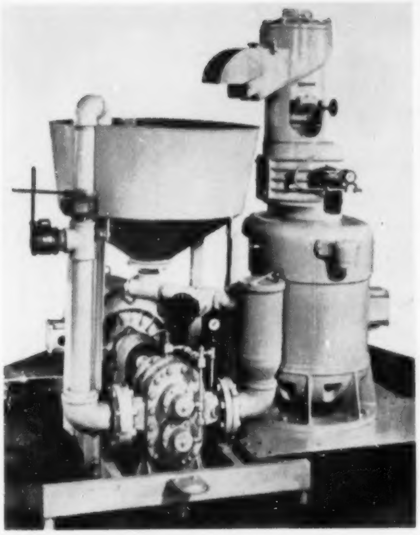


Fig. 23. Complete milling unit. (Courtesy Morehouse Industries.)

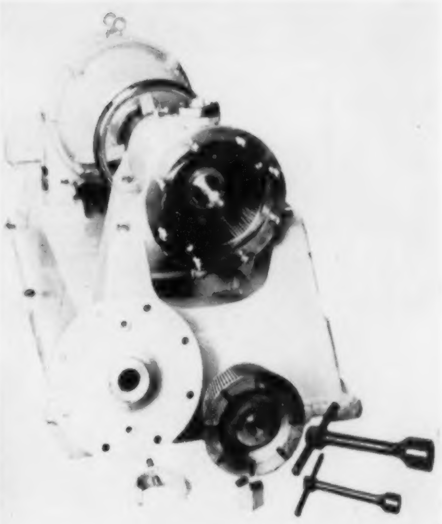


Fig. 24. Another type of mill. (Courtesy Chemicolloid Laboratories, Inc.)

Grease Milling and Deaeration Equipment

Grease milling and accessory deaeration equipment is found in the majority of modern grease plants. While milling of greases has been a part of some manufacturers' operations for many years, increased interest in multipurpose lithium soap base greases and in some of the non-soap thickened specialty lubricants has brought mills and additional deaeration equipment into many plants.

Two types of high speed mills are used in many grease plants. The internal construction of one mill using specially prepared stones for the rotor and stator is illustrated in Figure 22. The machine illustrated rotates at 5400 R. P. M. and is driven by a 40 H. P. electric motor. The complete unit is shown at the right in Figure 23. The other machine illustrated is a deaerator which works on a starved suction principle. Both machines are in successful use on a variety of greases.

The construction of another type of mill also in successful use on a variety of greases, is shown in Figure 24. This machine has a hardened steel rotor and stator. The rotor turns at 3600 R. P. M. The machine illustrated is driven by a 100 H. P. motor.

Both machines are offered in smaller sizes. Because formulations vary and the intensity of milling needed for greases made in various plants also varies, no fixed figures can be given for the capacity of either machine. For example, three different companies reported the capacity of the machines on a N. L. G. I. No. 2 grade of lithium grease as follows:

Company A.... 6,000 to 8,000 Pounds/Hour
Company B....12,000 to 14,000 Pounds/Hour
Company C....20,000 to 25,000 Pounds/Hour

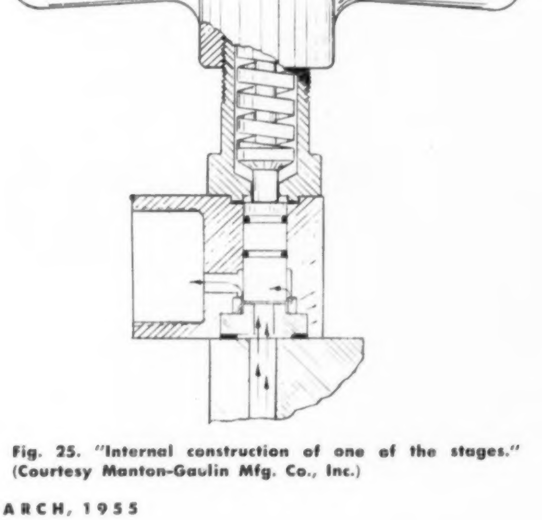


Fig. 25. "Internal construction of one of the stages." (Courtesy Manton-Gaulin Mfg. Co., Inc.)

Fig. 26. Complete unit as illustrated in Fig. 25. (Courtesy Manton-Gaulin Mfg. Co., Inc.)

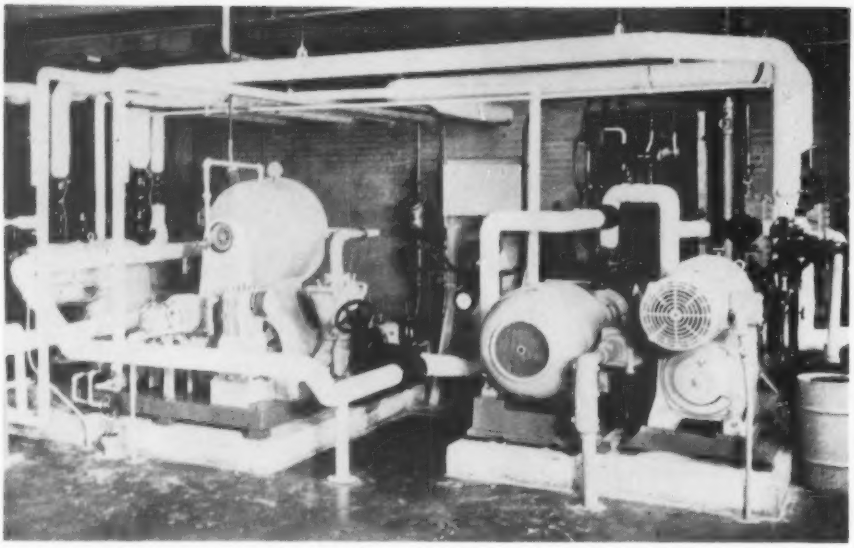


Fig. 27. On the left is a type of deaerator inuse in many grease plants. On the right are pumps. (Courtesy Cities Service Oil Co.)

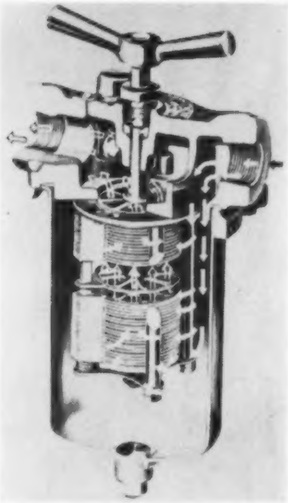


Fig. 28. Internal construction of filter and material flow. (Courtesy Cuno Engineering Corp.)

Another type of mill consists of a high pressure triplex piston type pump which forces material through an adjustable opening of small size. The material flows through the opening at a high velocity and impinges against a hardened alloy ring. This causes an intense action on the product. For grease manufacture, this working is done in two stages. Pressure drop per stage is about 3,000 p.s.i.g. The internal construction of one of the stages is shown in Figure 25. The complete unit is illustrated in Figure 26. This machine is rather new in the grease field. It is being used successfully on non-soap type thickened lubricants and as a result of some tests completed to date may have considerable application on the soap-thickened lubricants. This machine is also available in various sizes. The manufacturer reports that a working capacity of 15,000 pounds per hour requires a 125 H. P. 1200 R. P. M. motor. Smaller units require less power in proportion to flow rates.

Pilot plant size units are offered in all three types of mills. Thus it is possible to test the action of each machine on a small scale. Mills are well established in modern grease plants and are necessary in the processing of some greases. In the cases of other greases, mills will compensate for inferior agitation in the kettle. Manufacturing time cycles have been shortened materially in some cases. Some other greases cannot be improved by milling if properly kettle processed.

It should also be realized that milling will not always compensate for improper processing up to the point of milling, nor will it make good greases out of fundamentally inferior formulations.

An efficient type of deaerator in use in many grease plants is illustrated in Figure 27. Deaeration improves the appearance and sometimes improves the storage stability of greases. Some greases, when pumped into bearing housings, have contained so much air that they were self-energizing and when the pressure of the filling gun was released flowed back out of the enclosure in part. This caused some complaints which were solved by deaeration at the manufacturing plant.

Fig. 29. Plant installation, four units are arranged in parallel. (Courtesy Battenfeld Grease and Oil Corp.)

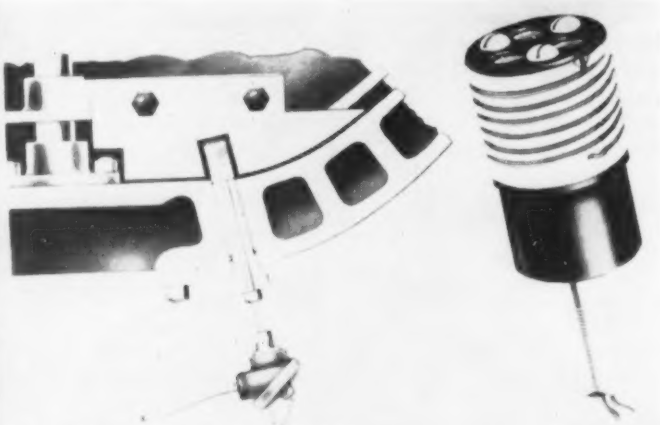


Fig. 30. "Thermocouple wires wound around an insulator which is immersed in the product." (Courtesy Buflovak Equipment Div. of Blaw-Knox Co.)

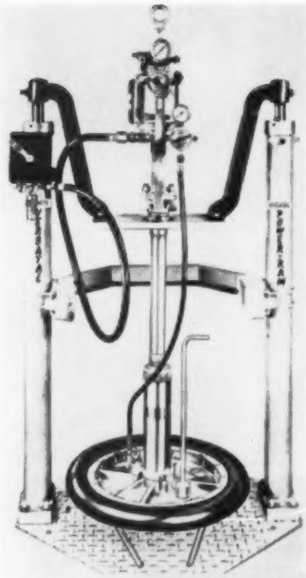


Fig. 31. Equipment used for transferring grease from one container to another. (Courtesy Alemite Div. of Stewart-Warner.)

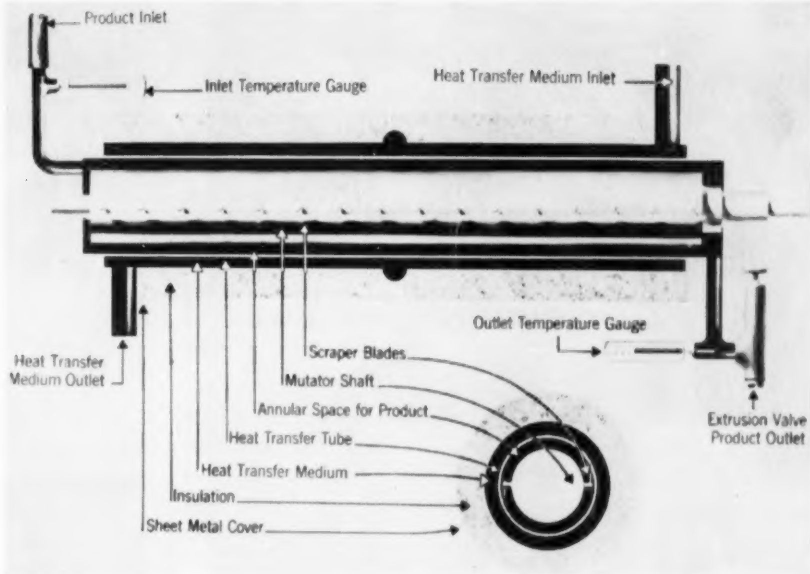


Fig. 32. Illustration of heat transfer and mixing machine. (Courtesy The Girdler Co.)

Grease Filtration

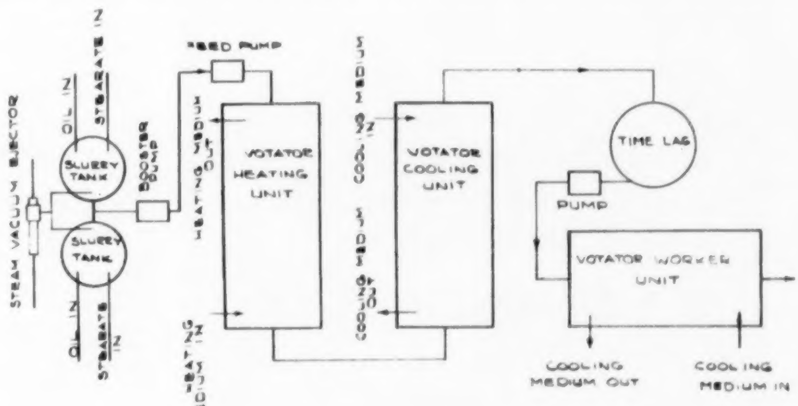
In almost all grease plants, some sort of filtration is a part of the manufacture. While many varieties of screening devices have been used, the units most commonly used are different sizes of an edge-type filter consisting of closely spaced discs with cleaning fingers to prevent plugging of the openings and excessive pressure drop. The internal construction of this type of filter and the material flow is illustrated in Figure 28. For best operation, these filters are motor driven at about one or two revolutions per minute.

A plant installation is shown in Figure 29. In this installation, four units are arranged in parallel. The cases are rated at a maximum working pressure of 250 p.s.i.g. Grid spacing is 0.008". Pipe connections are 250-pound standard. Filter element is 2¼" diameter by 8" length. Material is steel. The filters are driven by ratchets which operate from a sliding bar driven by one small gearhead motor. This arrangement was found to have many operating advantages over units of larger case design. Inlet and outlet connections are 2-inch. This system was found to work successfully at a grease flow rate of 75 G. P. M. even when greases were pumped in the heavy soap stage.

Temperature Measurement in Grease Kettles

The manufacture of most modern greases requires reasonably close control of temperature. In the grease kettle illustrated by Figure 2, one thermowell is at the bottom of the kettle and one part way up the side. The thermowells are isolated from the jacket to minimize local effects from the heating and cooling fluids. The scrapers are notched out to sweep the grease over the thermocouple. To minimize lags in response of the elements, barb wire thermocouples are being used. In one type heavy gage wire is used to prevent bending. Thermocouple wires are sealed with a pressure type fitting using teflon as a sealant. Another type in use is illustrated by Figure 30. In this design, the thermocouple wires are wound around an insulator which is immersed in the product. The purpose of this is to prevent errors from thermal conduction.

Fig. 33 "A flow diagram of the aluminum grease plant. A holding section to permit the grease to jell is incorporated." (Courtesy The Girdler Co.)



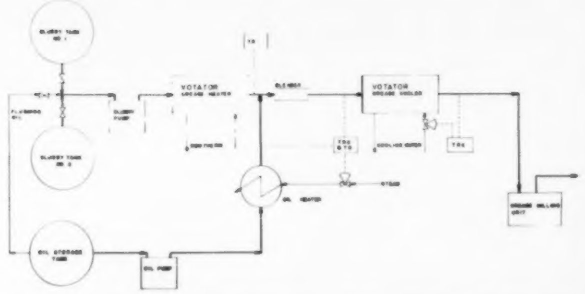


Fig. 34. "A flow diagram for the lithium grease plant." (Courtesy The Girdler Co.)

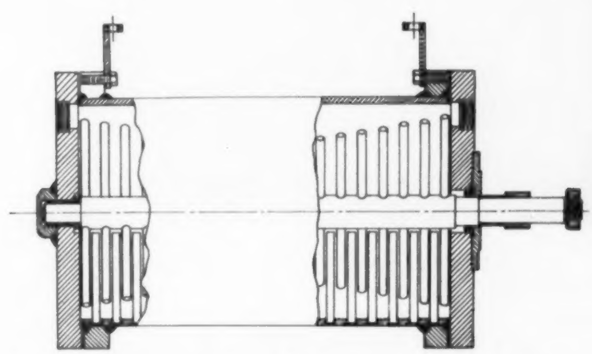


Fig. 35. "Cutaway view of the blender used in the lithium grease system." (Courtesy The Girdler Co.)

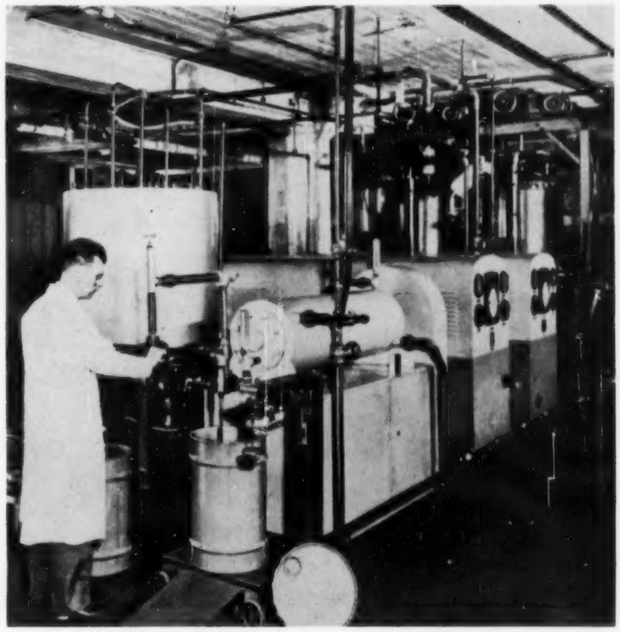


Fig. 36. View of a continuous aluminum grease plant in operation. (Courtesy The Girdler Co.)

Transfer of Grease for Miscellaneous Orders

In one plant it was often found necessary to transfer grease from 55-gallon drums to smaller containers. This was at one time done by hand which was an expensive and messy operation. This operation is now handled by the equipment shown in Figure 31. The cost of the equipment was recovered in less than three months.

Continuous Grease Plant Equipment

Complete compact continuous grease plants are available for the manufacture of aluminum stearate and lithium greases. These plants have been designed around a highly efficient heat transfer and mixing machine which is illustrated in Figure 32. A flow diagram of the aluminum grease plant is shown in Figure 33. The flow diagram for the lithium grease plant is shown in Figure 34. The two systems are similar in many respects. A holding section to permit the grease to jell is incorporated in the aluminum system. This is not needed in the lithium grease system.

The aluminum grease processing starts with a slurry containing all of the oil and soap while the slurry in the lithium system contains all of the soap and only half of the oil. This concentrated slurry is heated to the optimum temperature and the remainder of the relatively cool oil is added at the blender which precedes the Votator cooling unit. The blending step is omitted from the aluminum stearate process.

The manufacturer reports that the capacity of a Votator aluminum stearate grease processing plant is approximately 1500 pounds per hour; for lithium grease, the rated capacity is 2,000 pounds per hour. Approximately 70 to 75 horsepower is required for the operation of either system including all units, pumps, drives, etc. Approximately 260 pounds per hour of 125 p.s.i.g. steam is required for heating 1,500 pounds per hour of the aluminum grease slurry to 310°F. Dowtherm is used in heating the lithium grease to 400°F. High pressure steam or hot oil may be used instead of Dowtherm. 60 G. P. M. of water at 75°F is needed to cool the grease. Cold water is the preferred cooling medium but brine can be used. Either the aluminum or lithium grease plants can be installed in an area approximately 20' x 20' x 10' high.

The manufacturer reports that over-all heat transfer coefficients will range from 100 to 250 BTU/(hr.)/(sq. f.)/(°F).

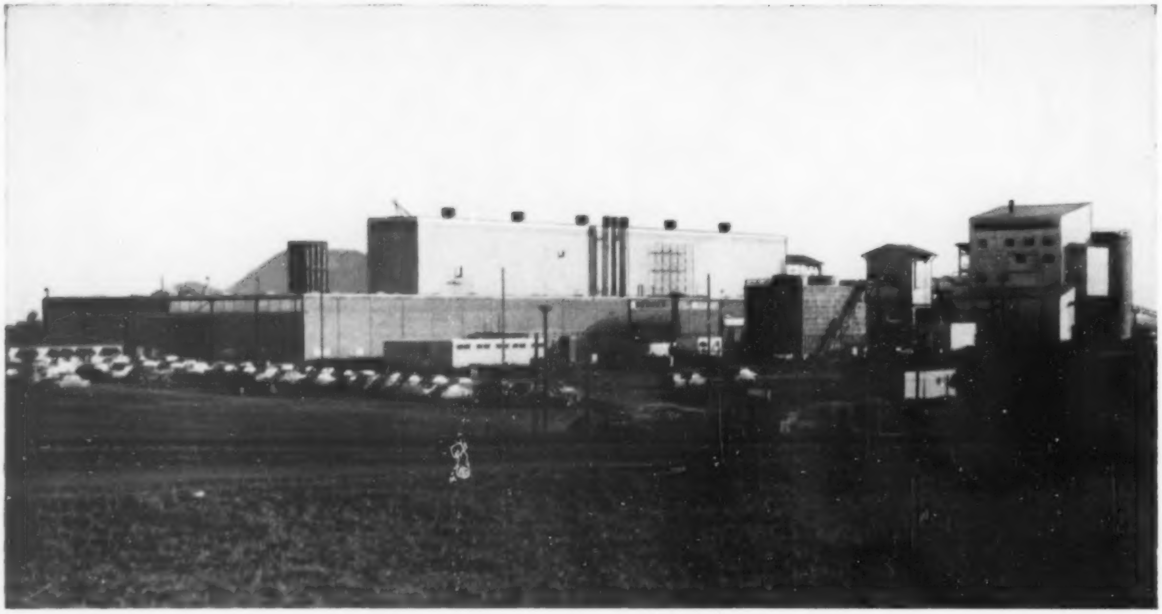
A cutaway view of the blender used in the lithium grease system is shown in Figure 35. Figure 36 shows a continuous aluminum grease plant in operation. A close-up view of the Votator continuous grease heating and cooling apparatus is shown in Figure 37.

Materials Handling

As the materials other than mineral oils which make up the finished grease amounts to only about 10% of the product, on the average, it could be expected that handling of these materials should not be a major problem.

In an efficient modern plant solid materials such as hydrated lime, fillers, and flaked or beaded high titer fats and fatty acids are best handled in multiwall bags. The pallet system of handling has been found workable.

Pamphlets giving excellent advice on the handling and storage of liquid and semi-solid fats and fatty acids are available from many of the suppliers of these materials. To avoid contamination, a completely isolated system consisting of a separate tank, pump, weigh tank and piping should be provided for each separate material. In plants where this simple rule was not followed, a tre-



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Here's a bird's-eye view of the biggest step yet in meeting industry's continuing demand for Lithium. Lithium Corporation has put on stream a lithium plant with the largest potential capacity in the world. The $7,000,000.00 project located at Bessemer City, North Carolina is producing Lithium Carbonate and Lithium Hydroxide for industry at large.

Unique in the Lithium industry, Bessemer City is processing run-of-mine ore directly through its chemical plant, as well as concentrates. The former eliminates the once necessary step of first concentrating the ore. The plant treats company-owned deposits of spodumene ore reserves in the adjacent King's Mountain area. The concentrates are from Canadian sources. Coupled with the company's original plant at St. Louis Park, Minnesota, a substantial increase in present productive capacity of the lithium industry is assured.

Lithium Hydroxide and the Grease Industry

Now, for the first time, the grease industry can depend on a continuing source of lithium hydroxide, from inventory and available for immediate shipment. It also means that the industry need no longer hold back on lithium research projects. Company and industry-sponsored research can bank on the closest cooperation from Lithium Corporation's management team.

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mendous amount of difficulty has been encountered.

While a slight amount of contamination among some of the mineral oils used may not be as serious as contamination involving fats and fatty acids, the same general rule should be used in handling mineral oils.

While provision should be made for very accurate weighing of all soap forming ingredients, either weigh tanks or meters have been found satisfactory for measuring oils into grease finishing kettles. While weighing of the mineral oils is inherently more accurate, it is questionable in many cases if the extra expense for the weighing installation is justified.

Studies in some grease plants have indicated that container storage, preparation, filling, and handling can amount to the largest item of labor expense. Bulk handling of finished greases has materially reduced costs in plants handling large volumes of greases. An excellent discussion of bulk handling and other solutions to materials handling problems in packaging grease has been published in *The Institute Spokesman*.[3]

Bulk handling of grease has been found successful for greases as heavy as No. 2 N. L. G. I. grade. By this means, the handling expense has been reduced considerably, since a completed batch in a kettle can be drawn immediately, at any time of the day or night, to the storage tank. This leaves the kettle available for starting another batch. Then the grease in bulk storage tank can be drawn into packages to fill orders when most convenient. Thus the drawing crews can be kept busy without any intervals of waiting for any particular batch of grease to be completed. Also, inventory of packaged greases may be kept at a minimum.

The Completed Plant

A successful grease manufacturing operation is possible only if the equipment is good and the complete installation carefully planned. Successful operation and good housekeeping begin on the drafting board. Figure 38 illustrates the control panel in one modern plant.

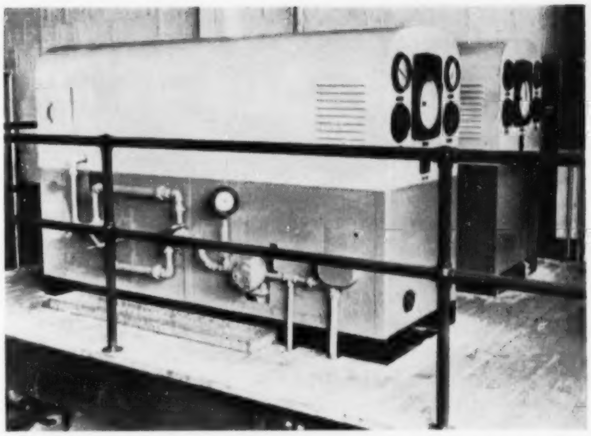

Fig. 37. Close up view of continuous grease heating and cooling apparatus. (Courtesy The Girdler Co.)

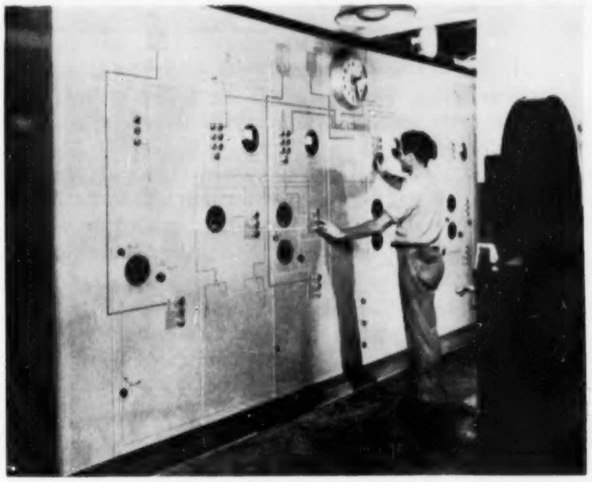

Fig. 38. Control panel in one modern plant. (Courtesy Cities Service Oil Co.)

Fig. 3? (below). "Illustrates the kettle installation which was planned for ease of operation and to enable good housekeeping." (Courtesy Cities Service Oil Co.)

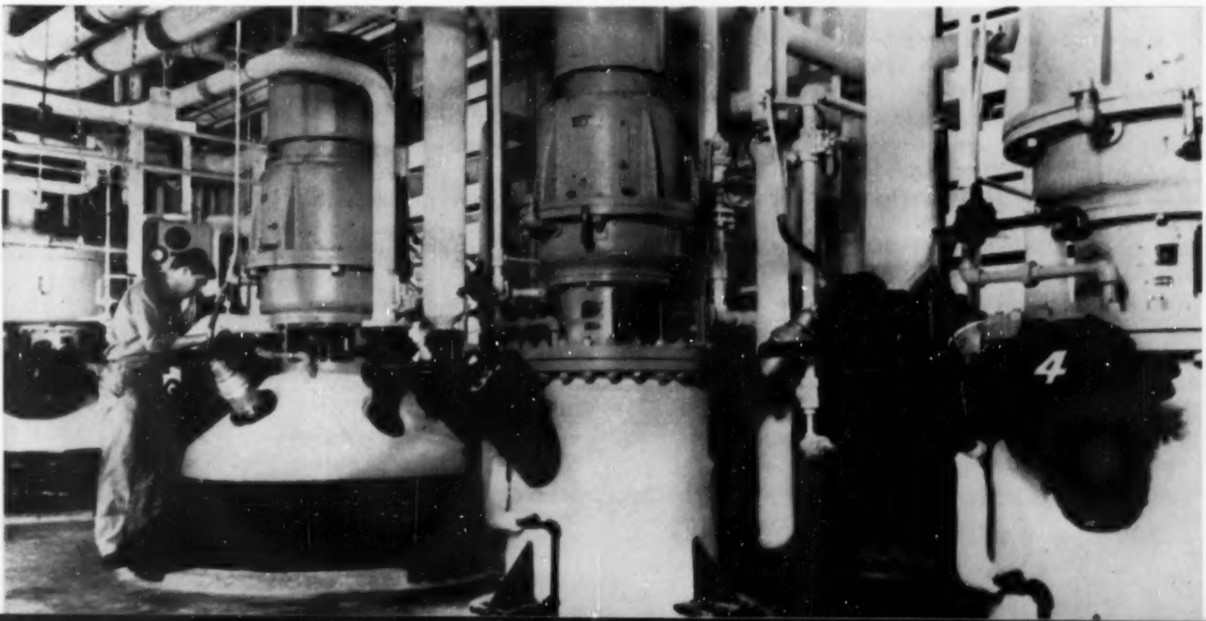

Figure 39 illustrates the kettle installation which was planned for ease of operation and to enable good housekeeping.

The Pilot Plant

As it seems logical to make mistakes on as small a scale as possible, the lubricating grease industry may find it advantageous to do more exploration on a pilot scale Some companies are now doing interesting development work on a small scale. It is probable that improved equipment and thus methods of processing greases will result from this work.

Increased labor costs are being faced in all manufacturing industry and the lubricating grease industry is no exception. Man has been rated mechanically at about 1/6 horsepower. The cost of 1/6 horsepower-hour (one manhour) of mechanical work done by man is about $3.00 in production work. If an electric motor can be installed to do this work on the basis of an electrical energy charge of 2 cents per kilowatt-hour, the same amount of mechanical work will cost about 1/3 cents.

It is thus understandable that grease manufacturers are finding it necessary to eliminate hand labor where possible. The writer believes that this trend will continue, and that the manufacturer who can most successfully apply mechanical equipment will enjoy a distinct advantage.

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3. Lueth, Paul E. Jr., *Materials Handling in Lubricating Grease Packaging Operations, The Institute Spokesman, April*, 1952.

Patents and Developments

Grease Containing Pectic Acid Salt

Greases having excellent high dropping points and highly desirable structure and stability characteristics at much reduced soap requirements are claimed to be obtained by incorporating into the grease thickener at least a substantial proportion of a metal salt of pectic acid. Preferably, this alkali metal pectic acid salt forms all or part of the high molecular weight fatty acid soap constituent of the grease thickener.

According to the Standard Oil Development Company patent 2,694,683, pectin is the jellying component of most fruits and it is present partly as a polymer and partly in the form of a calcium or magnesium salt. Free pectic acid is a tetra-basic acid with two free carboxyl groups, the two others being linked as esters with methyl alcohol. It may be regarded as triacetyl-arabino-galacto-tetra galacturonic acid dimethyl ester and, on hydrolysis, it yields about 65% galacturonic acid, 11.7% d-arabinose, 13.1% d-galactose, 6.5% methanol and 13% acetic acid.

The pectic acid salt preferably is present in the grease in the form of a complex with an alkali metal salt of a low molecular weight carboxylic acid.

The preferred method of the invention involves formation of the salt or salt or soap complex in situ in the lubricating oil in the course of the grease-making process. For this purpose the pectic acid and other high molecular weight fatty acids, if any, may be charged to a reaction zone and heated together with a portion of the lubricating oil to about 130°-170° F. Thereafter the low molecular weight acid may be added and the mixture neutralized, preferably with a slight stoichiometric excess of an aqueous solution of the metal base of about 30-50% concentration. Sufficient metal base should be used to give the grease a free alkalinity of about 0.1-1% as NaOH.

The mixture may then be dehydrated at temperatures of about 250°-350° F. When dehydration is substantially complete, further lubricating oil may be added and heating continued to about 450°-550° F. Thereafter, the grease may be cooled. When temperatures below 300° F. are reached, other conventional additives, such as anti-oxidants, particularly amino compounds, extreme pressure agents containing sulfur, halogen and/or phosphorus, etc. may be added in any conventional manner.

The invention illustrated by the following specific example:

Ingredients	*Wt. Per Cent*
Pectic acid	10.00
Hydrofol acids 54[1]	10.00
Acetic acid (glacial)	4.00
Sodium hydroxide	6.50
Phenyl alpha-naphthylamine	1.00
Blend of naphththenic-type mineral oil distillates having a viscosity of 50 S. S. U. at 210° F	68.50

[1]Hydrogenated fish oil acids corresponding in degree of saturation to commercial stearic acid.

PREPARATION

The pectic acid (brown powder), Hydrofol acid and about ½ of the mineral oil were charged to a grease kettle and warmed to 150° F. At this temperature the acetic acid was charged followed immediately by a 40% aqueous solution of sodium hydroxide. Heating was continued and at 300° F., when the soap mass in the kettle was fairly dry, the balance of the mineral oil was added. The mixture was further heated to 500°-515° F. At this temperature heating was discontinued and the mass cooled to 250° F., where the phenyl alpha-naphthylamine was added and the grease further cooled to 200° F.

Inspection of the grease showed the formation of some small specks. However, on Gaulin homogenization of the grease at higher rates of shear these specks were removed, resulting in an excellent smooth uniform very hard product.

PROPERTIES

Per cent alkalinity as NaOH	0.91
Penetrations, 77° F. mm./10:	
Unworked	96
Worked 60 strokes	103
Dropping point, °F	500†
Water washing test, per cent loss	None
Norma Hoffmann Oxidation Test, hours to 5 p. s. i. drop in O_2 pressure	235

Greases Containing Lithium Poly-12-Hydroxy Stearic Acid

Greases containing lithium soaps of 12-hydroxy stearic acid already have been disclosed in U. S. Patent 2,397,956, and they have been shown to exhibit superior properties, including particularly the ability to maintain consistency when mechanically worked. One of the salient features in the preparation of such greases is the step of heating the reaction mass, usually including most of the oil, to about 425° F. at which temperature the mass becomes fluid. There is further involved a controlled cooling rate for the stirred mixture from about 425° F. down to about 225° F.

This high temperature requirement in manufacture is claimed to represent a serious disadvantage from the standpoint of the practical art, since use of conventional grease equipment is not feasible and expensive special equipment is required. In U. S. Patent 2,695,878 issued to Sinclair Refining Company, a grease is disclosed containing the lithium soap of polymerized 12-hydroxy stearic acid of excellent quality obtainable with soap economy at temperatures not exceeding 330° F. By polymerized 12-hydroxy stearic acid is meant a composition formed by self reaction or condensation of 12-hydroxy stearic acid, the product probably comprising a mixture of the hemilactide, lactide and lactone of the acid, the trimer, and longer chain cyclic or linear polymers formed by interesterfication, together with the unreacted acid. The polymer is claimed to be formed readily by heating 12-hydroxy stearic acid, either alone or in presence of a trace of mineral acid, to about 150°-300° F. and holding the temperature for a few hours. The polymerized acid may be obtained as such on the market.

A typical method of preparation is as follows:

Six hundred parts of polymerized 12-hydroxy stearic acid and three hundred parts of mineral oil were charged to a steam heated grease kettle. These components were mixed thoroughly by stirring and heating to 180° F. (above melting point of the acid). A boiling solution of lithium hydroxide (5 parts by weight water and 1 part by weight lithium hydroxide monohydrate) was added to the oil-fatty acid system and the entire contents were stirred at 180° to 200° F. for thirty minutes. The temperature was held below 200° F. to keep the water present and thus aid saponification. At the end of thirty minutes, a full head of 120 p. s. i. steam was put on the kettle jacket to raise the temperature and drive off as much water as possible. The temperature remained at about 240° F. until most of the water had been evaporated then rose rapidly to 325° F. The dehydrated soap base was then held at 325° F. for one hour during which time about 500 parts of oil were added in small increments. The remainder of the finishing oil (3000 parts) was added just as rapidly as it could be mixed into the soap base (required about one hour). Cooling water was put on the kettle at the start of finishing oil addition to facilitate cooling.

When all of the finishing oil had been added and the kettle contents cooled to below 200° F., the oxidation inhibitors were added (22 parts of Hyamine B (2, 6- (dimethylaminomethyl-) 4-octyl-phenol) and 22 parts of octylated arylalkylated diphenyl amine) and thoroughly mixed. The grease was then cooled to 120° F. and processed through a colloid mill and vacuum deaerator at 1.5 pounds per minute and 0.005″ mill clearance.

ANALYTICAL GREASE CHEMIST AVAILABLE

Thirty-one years old, 4 years experience. Research or development preferred.

Reply to Box 311,
NLGI Spokesman,
4638 J. C. Nichols Parkway,
Kansas City 12, Mo.

J. R. BATTENFELD

GUY PETERS

THE WHO, WHEN and WHY of NLGI

. . . A Brief Sketch of the Organization's Early Days

People frequently ask who, when and why the National Lubricating Grease Institute was started. Available information indicates the idea of an organization for lubricating grease manufacturers sprang up around the early 1930's. Nothing tangible was done about it until two young men named J. R. Battenfeld and W. H. Saunders, Jr., started corresponding on the subject. Into this correspondence and general palaver came a third young man, Guy Peters.

No one seems too clear on how they actually assembled the group, but we do know that by July, 1933, they had incorporated a group they called the National Association of Lubricating Grease Manufacturers, Inc. They must have had unshakable belief in both this industry and the future. The $100.00 paid for incorporation was taken from a treasury that boasted of a balance amounting to $442.71—before the $100 was removed. In September, 1933, the first annual meeting was held with an attendance of 46. At that time there were 23 paid members.

During the course of the meeting the members elected J. R. Battenfeld the first president and Guy Peters temporary treasurer, later he became the first secretary. All three went on the board of directors. In 1935 Saunders became vice president and in 1936 was elected president.

W. H. SAUNDERS, JR.

J. R. Battenfeld served on the Board until his death in 1946. W. H. Saunders has continuously served on the Board since the first meeting. Guy Peters terminated his directorship in 1936.

At the time these three young men started NLGI the air was heavy with NRA. Its emblematic blue eagle fluttered from business stationery, business house windows and was even plastered on windshields. Little wonder that most of the time during its first two years of existence NLGI directors and new officers devoted most of their time to NRA Codes and getting new members in the hope the latter would provide sufficient income through their dues to establish a permanent and full time office for the Institute. Their complete ambitions for the latter idea didn't take place until July, 1946.

In the meantime NRA went out of existence about two years after NLGI was formed and the organization just about went with it. If it hadn't been for the iron determination of the three founders, plus a few others they had converted to their way of thinking organization-wise, it would have passed from the scene.

Today NLGI stands enviably in a top position among the 12,000 trade associations here in the United States. In 1952 it was chosen by a committee headed by the Secretary of Commerce as the best. Its official publication, the NLGI SPOKESMAN, has won one international and three national awards for journalistic achievement. In 1953 it won the top journalism award for industrial publications.

M. R. BOWER RETIRES

President of NLGI in 1938, Headed Sohio Oil Sales for 29 Years . . .

M. R. BOWER

Milton R. Bower recently retired after heading lubricating oil sales for the Standard Oil Company of Ohio for the past 29 years. At the present time he and Mrs. Bower are enjoying a belated and well earned vacation in Florida. Originally he had planned retirement for last July, but he was asked to remain until January first to clean the slate.

Widely known in the petroleum industry, his particular interest has for many years centered on the National Lubricating Grease Institute. Recalling early years of the organization, he believes he has consistently represented his company in it since about a year after formation. That was back in the days when not too many people were interested in membership. Along with a few other pioneers he built NLGI into the outstanding organization it is today.

For many years it was an uphill job and he cannot recall all the committees on which he served. Highlighting his service in NLGI was his term as vice-president in 1938, shortly after the first issue of the NLGI SPOKESMAN came off the press. In 1939 his contribution to this industry was again recognized and he was elected president. That was the very important year the NLGI Penetration Numbers Classification of Lubricating Greases was adopted and copyrighted. That firmly established NLGI in the Petroleum Industry. He has continuously served on the board of directors since 1935.

In addition to his considerable interest and contribution to NLGI, "Milt" has also found time to actively participate in other petroleum organizations. He was a member of the American Petroleum Institute, 25 Year Club of the Petroleum Industry, Committee D-2 of ASTM and Committee Z11 of the American Standards Association. He took a lively interest in the Society of Automotive Engineers, is an active Mason and member of Rotary International.

Getting into the personal side, he was born June 3, 1889, in East Rochester, Ohio, attended high school in Youngstown and Union College in Alliance. He joined Sohio on November 5, 1913, in the Northern Ohio District Office. He was transferred to lubricating sales in February, 1915, becoming a lubricating salesman in the Cleveland District a year later and lubricating sales manager in the Eastern District in June, 1924. He was named manager of lubricating oil sales in July, 1925.

What does a man with such varied interests in addition to his job expect to do in the future? Among other things he plans to travel extensively where he expects to give full play to his hobby of photography. For pleasure he is definitely going to play golf. Another very important personal interest is his interest in seven grandchildren. He has two sons, Wayne and Donald; a daughter, Mrs. Virginia Black. Many happy days to this grand fellow.

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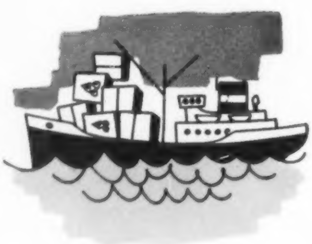
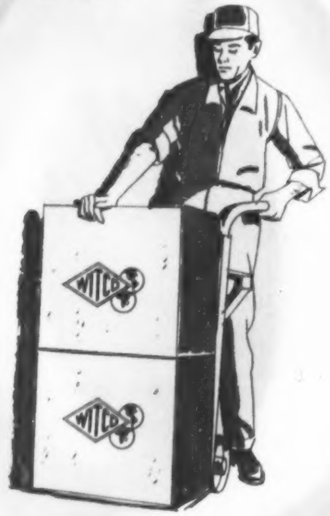
Central Division: 135 So. La Salle Street, Chicago 3
Pacific Division: Russ Building, San Francisco 4





FUTURE MEETINGS of the Industry

APRIL, 1955

11-15 Greater New York Safety Council (annual convention and exposition), Statler Hotel, New York, N. Y.

13-15 American Society of Lubrication Engineers (tenth annual meeting and lubrication exhibit), Hotel Sherman, Chicago, Illinois

MAY, 1955

9-12 American Petroleum Institute (Division of Refining, midyear meeting), Jefferson Hotel, St. Louis, Mo.

16-18 American Petroleum Institute (Division of Marketing, Lubrication Committee), The Greenbrier, White Sulphur Springs, W. Va.

16-18 American Petroleum Institute, (Division of Transportation, Products Pipe Line Conference), Edgewater Beach Hotel, Chicago, Ill.

19-20 National Industrial Conference Board, Waldorf-Astoria Hotel, New York, N. Y.

23-25 American Petroleum Institute (Division of Marketing, midyear meeting), Chase and Park Plaza Hotels, St. Louis, Mo.

JUNE, 1955

6-15 Fourth World Petroleum Congress, Rome, Italy

12-17 SAE Golden Anniversary Summer Meeting, Chalfonte Haddon Hall, Atlantic City, N. J.

26 to July 1 American Society for Testing Materials (annual meeting), Chalfonte-Haddon Hall, Atlantic City, N. J.

SEPTEMBER, 1955

26-27 Independent Oil Compounders Association (8th annual meeting), Hotel Bismarck, Chicago, Ill.

OCTOBER, 1955

23-25 National Assn. of Oil Equipment Jobbers (4th annual meeting), Hotel President, Kansas City, Mo.

31 to Nov. 2 NLGI ANNUAL MEETING, EDGEWATER BEACH HOTEL, CHICAGO, ILL.

NOVEMBER, 1955

14-17 American Petroleum Institute (35th annual meeting), San Francisco, Calif.

JUNE, 1956

17-22 American Society for Testing Materials (annual meeting), Chalfonte-Haddon Hall, Atlantic City, N. J.

Industry NEWS

New Plant for Jones & Laughlin in Atlanta

Production of steel shipping pails for southern manufacturers began Thursday, March 3, on new facilities of Jones & Laughlin Steel Corporation here.

The new pail line has been installed in J&L's Container Division Plant at 1280 Chattahoochee Avenue NW. This plant replaced J&L's former galvanized ware production facilities here a little over a year ago.

Lacquer-lined and decorated steel shipping pails will be produced on the new line in 3½-gallon or 5-gallon capacity. Users of the pails will be companies which ship paint and varnish, foods, oil and chemicals, soaps, shortenings, and many other products.

Growth of the paint industry in southern states was a major influence in J&L's decision to locate its new pail line in Atlanta, according to F. T. Barton, J&L's Vice President—Special Products & Services.

"Our galvanized ware plant here is the largest of its kind in the South," says Mr. Barton. "The new pail line adds still another service to an area where shipments of finished and semi-finished goods are rising fast year by year."

New facilities for producing 3½ and 5 gallon steel pails.

Under Jack S. Browne, of 350 East Paces Ferry Road, District Sales Manager for the Container Division, distribution of the shipping pails will cover a seven-state area with 24-hour service.

Eugene L. Brintley, of 124 La Fayette Drive NE, is Plant Manager. The Atlanta Container Division Plant is one of nine operated by J&L. The others, which produce galvanized ware, steel shipping pails, and steel drums, are located in Bayonne, N. J.; Lancaster, Pa.; Kansas City, Kans.; Cleveland; Philadelphia; New Orleans; Toledo, Ohio, and Port Arthur, Tex.

The pail line at Atlanta is the second to be put into operation by J&L in three months. The other is at Lancaster, Pa.

J&L also has a District Sales Office in the Healey Building, Atlanta, to handle sales of other J&L products. These include light structurals, cold finished steels, hot rolled products, wire products, wire rope, sheet and strip, tin plate, seamless pipe, and special alloys.

R. Roddey Garrison, of Garroux Road NW, has been Atlanta District Sales Manager for 23 years.

Jones & Laughlin Steel Corporation, with headquarters in Pittsburgh, is one of the world's largest steel companies. It is headed by Admiral Ben Moreell, Board Chairman, who gained fame during World War II as commander of the Navy's Seabees.

Merry-Go-Round Speeds Canning of Motor Oil

A miniature merry-go-round invented by a veteran mechanic is spinning out a substantial increase in canned motor oil production at Shell Oil Company's Sewaren, N. J., canning plant. According to Shell engineers, it may lead to a minor revolution in the canning industry. They say the idea behind the invention—"so simple it should have been thought of years ago"—will work as well in canning soup, beans or beer as it does in canning oil.

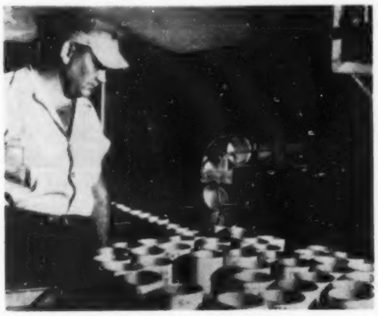
The new device, invented by George Radich, who has been with the plant for 19 years, is a simply-constructed turntable that moves empty cans to a can-filling machine much faster than they had been moved before. It serves the same purpose as a traffic circle that takes cars from two side roads and feeds them into one main road.

For the Shell plant, the turntable has broken a bottleneck that existed as long as a canning machine received cans from only one conveyor line. The conveyor moved empty cans from a box car to the canning machine, and the rate of production was limited because there was no way of maintaining an uninterrupted flow of cans from the car to the conveyor to the machine. Radich decided to unload two or more cars at once and feed the combined output to the canning machine over a single conveyor line.

To do this he put up two feeder conveyors—to unload cans from two cars at once—and fed the two lines of cans on to the turntable. The table feeds all the cans on a single conveyor that goes to the canning machine. Now the conveyor is always full of cans and the machine can operate at full capacity.

Shell has installed four of the turntables, serving machines that fill cans of various sizes. Production has risen from a daily average of 2800 cases of

24 cans each to 3800 cases. It is expected to reach 5000 cases a day in 18 months.



The turntable, which Radich calls an "Unscramble," is a slowly-revolving, flat metal disc about three feet in diameter. Aside from the speed at which it turns—which must be carefully regulated to ensure receiving and discharging cans at the desired rate—the essential feature of the Unscrambler is an automatic brake that guides oncoming cans to the outer edge of the table and keeps them from knocking each other down. Shell is willing to license the manufacture of the device in the belief that it may be put to more general use.

API Marketing Division Issues Two New Booklets

Two Marketing Division booklets designed to boost motor oil sales at service stations have proved so helpful that both have gone into a third printing to meet the overwhelming demand, according to the American Petroleum Institute.

Entitled "Know Your Motor Oil" and "How to Sell Motor Oil," the booklets are double-barreled sales helps for service station dealers and attendants.

Total sales for the booklets to date are almost a quarter million copies, A. J. Rumoshosky, director of the Institute's Marketing Division, said today.

"We have been deluged with orders for these booklets," Rumoshosky said. "It is not too much to say that they represent best sellers for motor oil marketers."

He said that orders for the booklets have come from marketers of all sizes—from the largest companies to individual service station dealers.

Rumoshosky continued: "We have also received endorsements from marketing vice presidents of larger jobbers

and from many individual service station operators—all voluntary and unsolicited."

The booklets are priced at 20 cents each. Copies are available from the Division of Marketing, American Petroleum Institute, 50 West 50th Street, New York 20, New York. Quantity discounts are available on orders for more than 100 copies of either booklet. For orders of less than $10, money orders or checks must be enclosed with the orders.

"Know Your Motor Oil" can be used to give service station dealers and attendants practical product information in on-the-job sales training. It can be used to convince customers both of motor oil quality and of the need for frequent crankcase oil drains.

This booklet explains such important topics as: the functions of motor oil; the enemies of engine performance overcome by quality motor oils; and contaminants which eventually spoil motor oil. "Know Your Motor Oil" also covers: the SAE viscosity numbers; motor oil additives; the API lubrication service classifications; and the new API crankcase oil drain recommendation.

Its companion piece, "How to Sell Motor Oil," is a practical guide to effective motor oil merchandising. This sales manual is written from the point of view of an experienced service station operator. "How to Sell Motor Oil" illustrates proven techniques for increasing the ratio of motor oil to gasoline sales.

Included in "How to Sell Motor Oil" is a chart to help each dealer—no matter what size or type of operation he has—figure the potential profits from his motor oil business.

Philadelphia Quartz Introduces New Thickening Agent

The Philadelphia Quartz Company, manufacturers of sodium and potassium silicates, has introduced under the trade name of "QUSO," a new form of amorphous silica as a thickening agent in the manufacture of lubricating greases. The new material produced by a process for which patent applications have been made is a white, very light, extremely finely divided powder. It has an average ultimate particle size of approximately 15 millimicrons.

Freedoms Foundation Honors API's "Colonel Drake"

For "helping to bring about a better understanding of the American way of life," the American Petroleum Institute's latest motion picture, "The Story of Colonel Drake" has been awarded the George Washington Honor Medal by the Freedoms Foundation.

This is the fourth time that a public information film produced by the Institute and its Oil Industry Information Committee has been cited by the Foundation.

Announcement of the newest award was made by Dr. Kenneth D. Wells, president of Freedoms Foundation, and Don Belding, chairman of the board. They hailed "The Story of Colonel Drake" as an "outstanding achievement." Formal presentation of the Honor Medal will be made later.

Previous API films which have been honored by the Foundation were "Crossroads, U.S.A.," "Man on the Land," and "24 Hours of Progress."

In each case, the objective of the motion picture was to tell the story of oil, its development as an industry and its contributions to social progress under the system of free enterprise which is the basis of the American way of life.

"The Story of Colonel Drake" was released for public showing last October. Starring noted actor Vincent Price in the lead role, it is a faithful recreation of the historic moments near Titusville, Pa., in 1859 when the world's first commercial oil well was brought in. It was this well which marked the beginning of the modern oil industry.

A dramatic Technicolor production, it already has been seen by more than a million persons in motion picture theaters, on television, and at meetings, schools, clubs, and the like. It was planned and supervised for the API by Film Counselors, Inc.

Prints of the motion picture may be purchased or borrowed through any District Office of the Oil Industry Information Committee.

Witco Acquires Half Interest In Ultra Chemical Works

Witco Chemical Co. has recently acquired a half interest in Ultra Chemical Works, Inc., of Paterson, N. J.

Ultra is a large independent producer of industrial and household detergents, wax emulsions and specialty chemicals for the textile industry, and many highly specialized synthetic organic chemicals. Ultra's principal plant is at Paterson, and additional plant facilities are maintained at Joliet, Ill., and Hawthorne, Calif.

The management of Ultra will continue, and no changes in personnel are contemplated.

Witco manufactures a diversified line of industrial chemicals for the rubber, paint, plastics and other industries. Witco recently purchased the chemical manufacturing facilities of the Emulsol Corporation of Chicago, manufacturers of many chemicals used in a variety of industries, and has organized the Emulsol Chemical Corporation to continue this business under the same management.

Witco and associated companies now operate 14 plants and 10 sales offices in the United States. The English company, Witco Chemical Co., Ltd., has offices in London and Manchester, with a plant at Droitwich.

Du Pont Establishes New Sales And Technical Service Group

The Petroleum Chemicals Division of the Du Pont Company has established a new sales section and a new technical service group to prepare for new developments in the field of petroleum additives and to improve world-wide customer service, it was announced today by David H. Conklin, director of sales.

"In addition, to improve the domestic sales setup for tetraethyl lead and other additives, new sales districts also have been formed in the Middle Atlantic area with offices in Philadelphia, and in the Middle West with offices in Detroit," Mr. Conklin said.

The new additives sales group, headquartered in Wilmington, will be headed up by R. M. Glover, formerly manager of the division's Mid-Continent region.

PEOPLE in the Industry

McCurdy to Shell's Board

R. C. McCurdy, president of Shell Chemical Corporation, has been elected to the board of directors of Shell Oil Company, it was announced recently.

Mr. McCurdy has been president of Shell's chemical company since 1953. He joined Shell Oil as a production engineer in 1933 after his graduation, with the degree of Engineer of Mines, from Stanford University. In 1939 he was named exploitation engineer at Los Angeles and, following assignments in New York and Washington, became chief exploitation engineer at Los Angeles in 1943. Two years later, he was appointed manager of the company's San Joaquin, Calif., production division.

In 1947, Mr. McCurdy joined a Shell Group Company in Venezuela and he became general manager there in 1950.

R. C. McCURDY

Mr. McCurdy is a native of Newton, Iowa. He was elected last year to the board of directors of the Manufacturing Chemists' Association and is active in a number of other professional and civic organizations.

Bennett Industries Promotes Ernst

Harry Le Pan, Vice-President of Bennett Industries of Peotone, Illinois, manufacturer of steel containers and hi-bake lined pails, has announced the promotion of Robert R. Ernst to the position of Assistant General Sales Manager.

ROBERT R. ERNST

Mr. Ernst joined Bennett in 1952 as a district sales representative for the North Central States.

In addition to his sales management duties Mr. Ernst has been given charge of the firm's advertising and sales promotion activities.

He was formerly employed by General Foods Corporation as a Sales Representative for the Maxwell House Coffee Division.

Midwest Research Appoints Thornton Technical Director

Dr. M. H. Thornton, one of the country's outstanding authorities in industrial and agricultural chemistry, has been named Technical Director of Midwest Research Institute, Kansas City, Missouri, it was announced today by Dr. Charles M. Kimball, President.

The post is a new one, created recently by the Institute's Board of Governors. Dr. Thornton has been on the Institute staff nine years and recently has been Director of Chemical Sciences.

A member of the staff at Purdue University from 1923 to 1946, Dr. Thornton has done research work in a wide scope of fields, including dehydrated foods, basic studies in fats and oils, development of analytical methods, and identification of biologically important glucosides. In cooperation with the Department of Agriculture, he has developed many new commercial uses for soybean products.

He holds a number of patents on industrial production of plant sterols and plant phosphatides and is the author of numerous technical papers and a member of many technical societies.

As head of the Chemistry Sciences Section at Midwest, he has in recent years directed many diverse research projects, ranging from inquiries into cancer to smog control.

In his new position, Dr. Thornton will supervise directly the work of the four divisions of the Institute, including physics, engineering, chemistry, research and chemical engineering.

NLGI Associate and Technical Mem

CONTAINER AND CLOSURE MANUFACTURERS

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Central Can Company
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Representative—Henry Frazin

Continental Can Company, Inc.
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Representative—T. A. Graham

Geuder, Paeschke & Frey Company
324 North Fifteenth St., Milwaukee 1, Wis.
Representative—Neil Savee

Inland Steel Container Company
6532 South Menard Ave., Chicago 38, Ill.
Representative—Robert J. Greenebaum

Jones & Laughlin Steel Corporation
Container Division
405 Lexington Ave., New York 17, N. Y.
Representative—Jerry Lyons

National Steel Container Corp.
6700 South LeClaire Ave., Chicago 38, Ill.
Representative—Henry Rudy

The Ohio Corrugating Company
917 Roanoke Ave. S. E., Warren, Ohio
Representative—Lawrence F. McKay

Rheem Manufacturing Company
477 Madison Ave., New York 22, New York
Representative—F. J. Blume

Rieke Metal Products Corporation
Auburn, Indiana
Representative—Mahlon E. Rieke

Trilla Cooperage, Inc.
2524 Blue Island Ave., Chicago 8, Ill.
Representative—Lester Trilla

United States Steel Products
Division, United States Steel Company
30 Rockefeller Plaza, New York 20, N. Y.
Representative—Wm. I. Hanrahan

Vulcan Stamping & Mfg. Co.
P. O. Box 161, Bellwood, Illinois
Representative—H. B. Scharbach

MANUFACTURERS OF EQUIPMENT FOR APPLICATION OF LUBRICATING GREASES

Aro Equipment Corporation
Bryan, Ohio
Representative—R. W. Morrison

Balcrank, Inc.
Disney near Marburg, Cincinnati 9, Ohio
Representative—Richard P. Field

Gray Company, Inc.
60 Northeast 11th Ave., Minneapolis 13, Minn.
Representative—B. A. Beaver

Lincoln Engineering Company
5701 Natural Bridge Ave., St. Louis 20, Mo.
Representative—G. A. Hubbard

Stewart-Warner Corporation
Alemite Division
1826 Diversey Parkway, Chicago 14, Illinois
Representative—D. C. Peterson

United States Air Compressor Co.
5300 Harvard Ave., Cleveland 5, Ohio
Representative—C. A. Bening

MARKETING ORGANIZATIONS

California Texas Oil Company, Ltd.
551 Fifth Ave., New York 17, New York
Representative—Hal U. Fisher

Canadian Petrofina Limited
1015 Beaver Hall Hill
Montreal, Quebec, Canada
Representative—M. E. Wight

REFINERS

Farmers Union Central Exch., Inc.
P. O. Box G, St. Paul 1, Minnesota
Representative—H. F. Wagner

Mid-Continent Petroleum Corp.
Mid-Continent Bldg., P. O. Box 381, Tulsa, Okla.
Representative—J. W. Basore

Valvoline Oil Company
Division of Ashland Oil & Refining Co. Box G
Freedom, Pennsylvania
Representative—D. A. Smith

SUPPLIERS OF EQUIPMENT FOR MANUFACTURING LUBRICATING GREASES

Blaw-Knox Company
Buflovak Equipment Division
1543 Fillmore Ave., Buffalo 11, New York
Representative—Edward V. Hegg

Chemicolloid Laboratories, Inc.
30 Church St., New York 7, New York
Representative—David F. O'Keefe

The Girdler Company
A Div. of National Cylinder Gas Co. Box 987
Louisville 1, Kentucky
Representative—J. E. Slaughter, Jr.

Manton-Gaulin Mfg. Co., Inc.
44 Garden Street
Everett 49, Massachusetts
Representative—G. W. Eldridge

Morehouse Industries
707 Henry Grady Building, Atlanta 3, Georgia
Representative—George E. Missbach

The C. W. Nofsinger Company
906 Grand Ave., Kansas City 6, Missouri
Representative—C. W. Nofsinger

Stratford Engineering Corporation
1414 Dierks Bldg., Kansas City 6, Missouri
Representative—D. H. Putney

SUPPLIERS OF MATERIALS FOR MANUFACTURING LUBRICATING GREASES

Acme-Hardesty Company
60 East 42nd St., New York 17, New York
Representative—W. C. Hardesty

American Cyanamid Company
30 Rockefeller Plaza
New York 20, New York
Representative—R. B. Wainright

Archer-Daniels-Midland Company
Chemical Products Division, 2191 W. 110th St.
Cleveland 2, Ohio
Representative—Frank C. Haas

Armour & Co., Chemical Division
1355 West 31st St., Chicago 9, Illinois
Representative—H. F. Whitler

The Baker Castor Oil Company
120 Broadway, New York 5, New York
Representative—H. H. Fritts

Darling & Company
4201 South Ashland Ave., Chicago 9, Illinois
Representative—G. W. Trainor

E. I. du Pont de Nemours & Co.
Wilmington, Delaware
Representative—John R. Sabina

The Elco Lubricant Corporation
Jennings Road & Denison Avenue
Cleveland 9, Ohio
Representative—Frank X. Sieloff

Emery Industries, Inc.
4300 Carew Tower, Cincinnati 8, Ohio
Representative—R. F. Brown

Enjay Company, Inc.
15 West 51st St., New York 19, New York
Representative—Sidney W. Fay

Foote Mineral Company
18 W. Chelten Ave., Philadelphia 44, Penn.
Representative—W. F. Luckenbach

General Mills, Inc.
Chemical Division, 400 Second Ave. South
Minneapolis 1, Minnesota
Representative—Abner C. Hopkins, Jr.

A. Gross and Company
295 Madison Avenue, New York 17, N. Y.
Representative—Eugene W. Adams

W. C. Hardesty Company, Inc.
P. O. Drawer 110, Dover, Ohio
Representative—W. G. McLeod

Harshaw Chemical Company
1945 East 97th Street, Cleveland 6, Ohio
Representative—W. J. Straka

Leffingwell Chemical Company
P. O. Box 191, Whittier, California
Representative—D. E. Murphy

Lithium Corporation of America, Inc.
Rand Tower, Minneapolis 2, Minnesota
Representative—Walter M. Fenton

...bers... *Supporting Your Organization These Suppliers to this Industry and Marketers of its Products Hold Membership in NLGI*

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